TECHNOLOGY DEPARTMENT

The
CHEMICAL AGE

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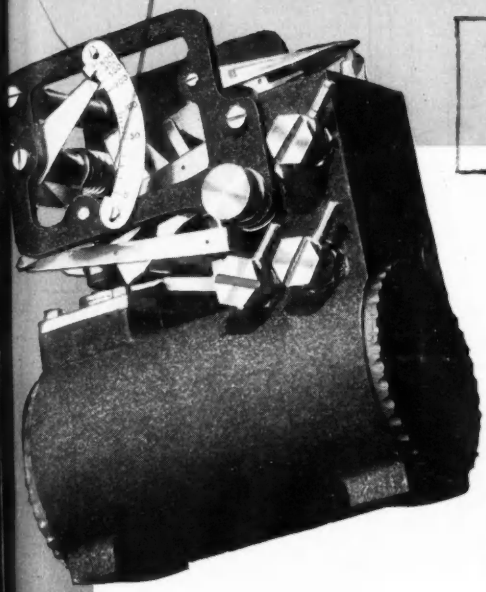

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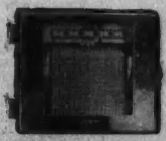

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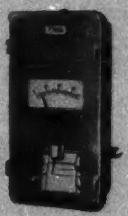

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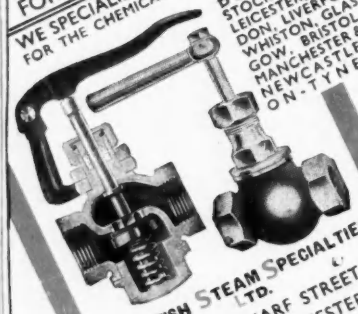

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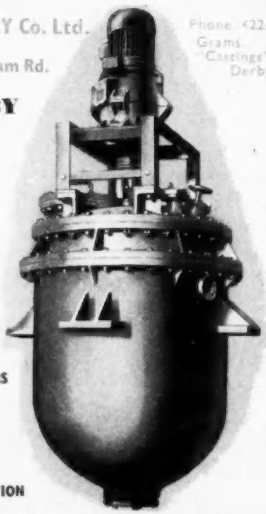

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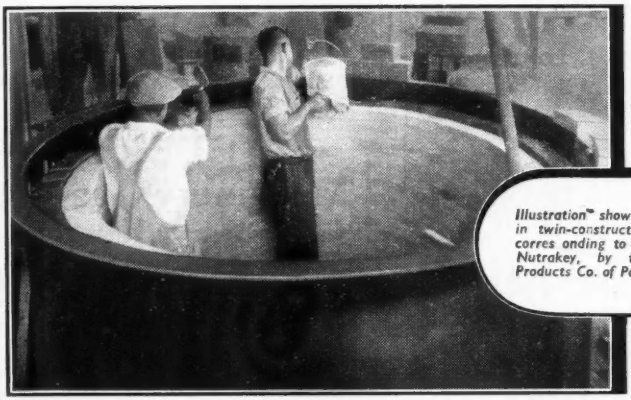

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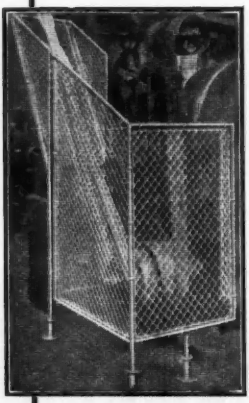

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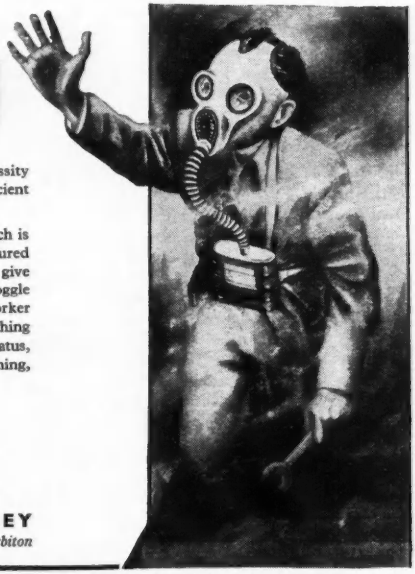

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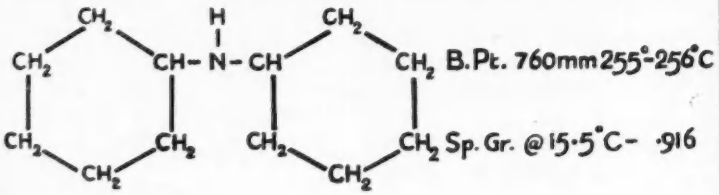

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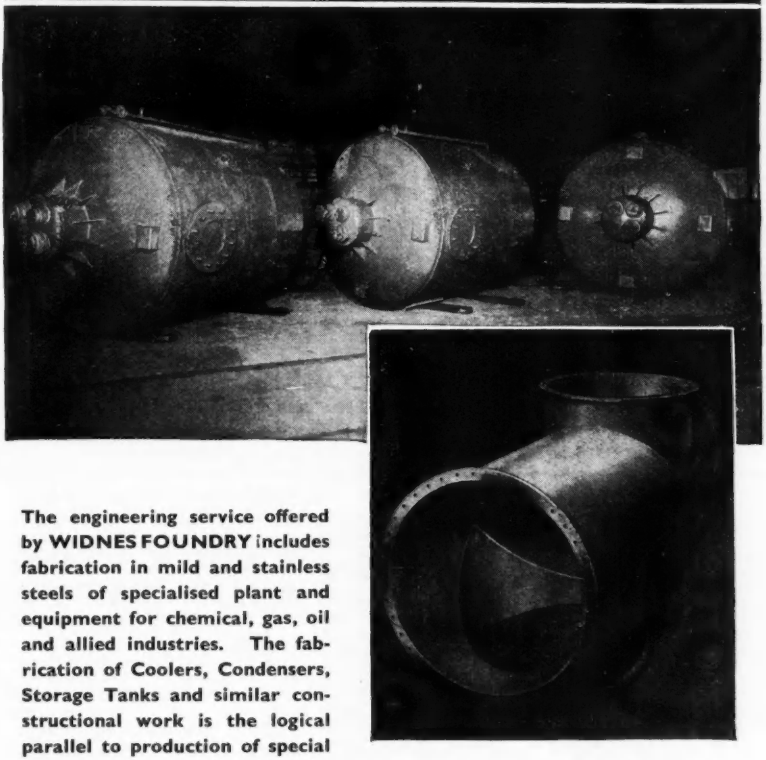

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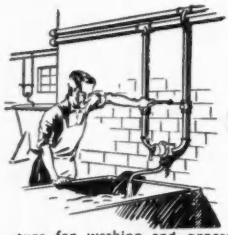

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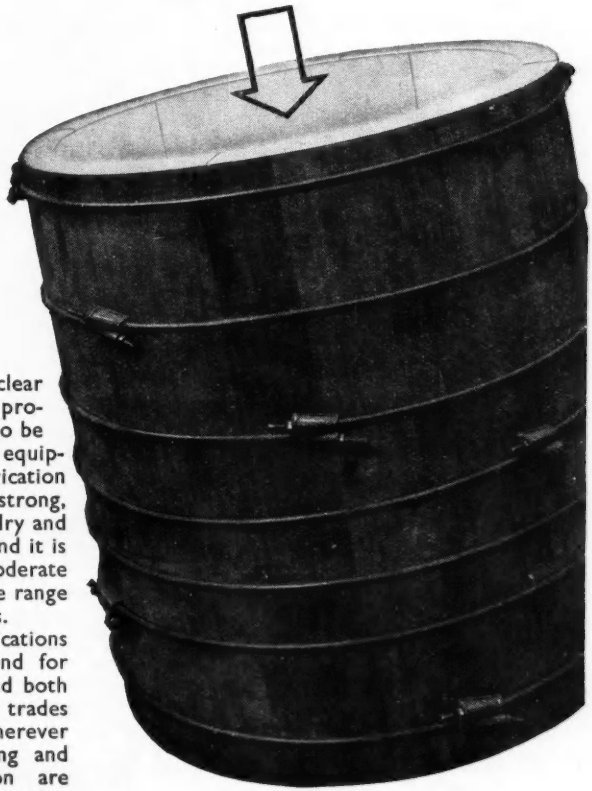

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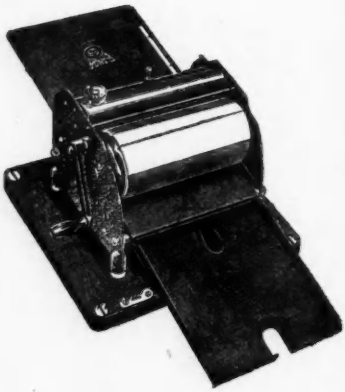

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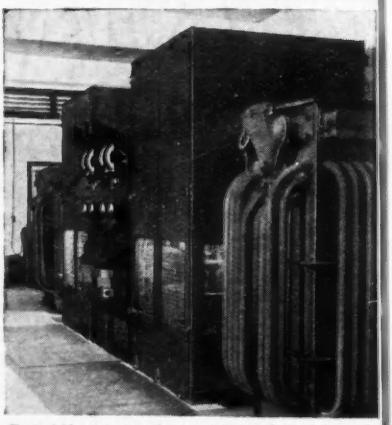

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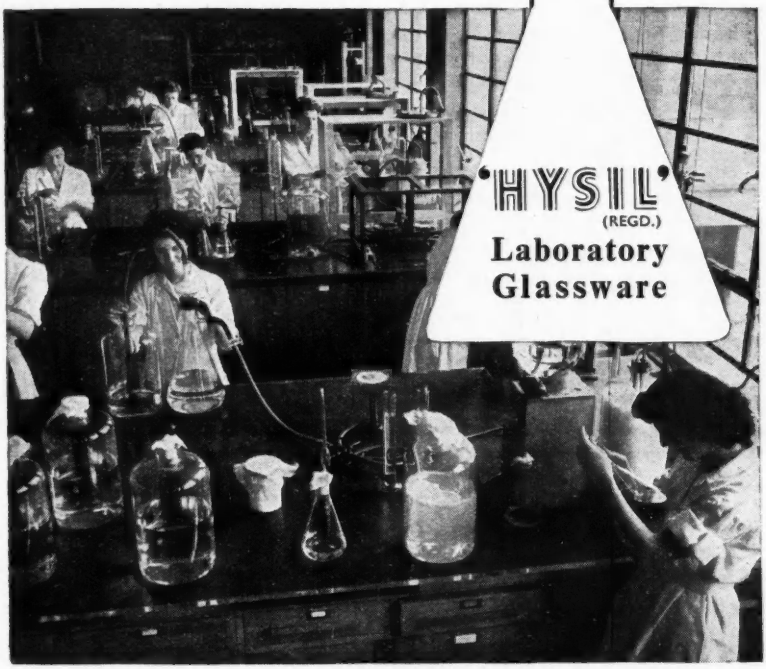

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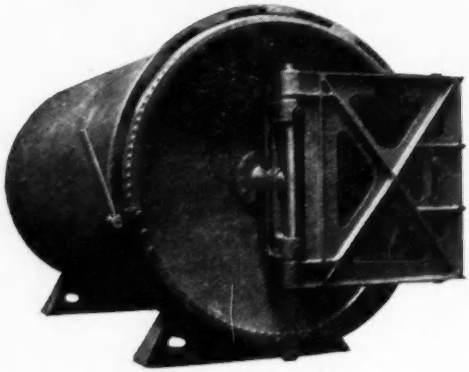

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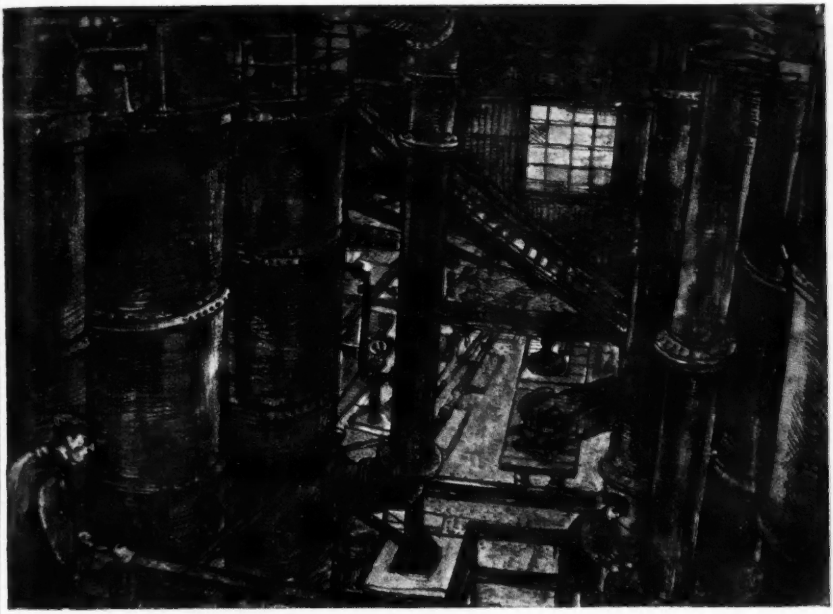

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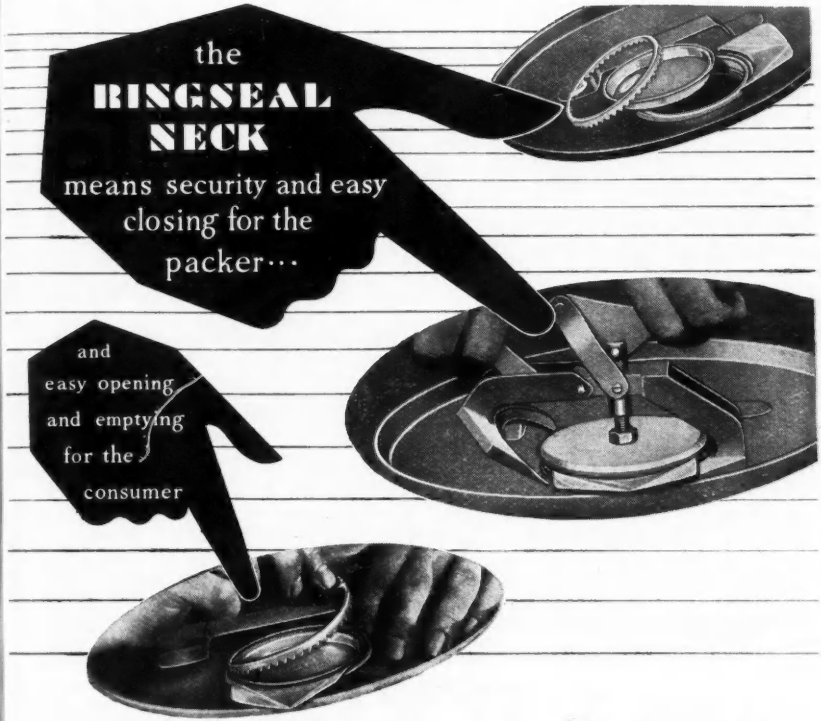

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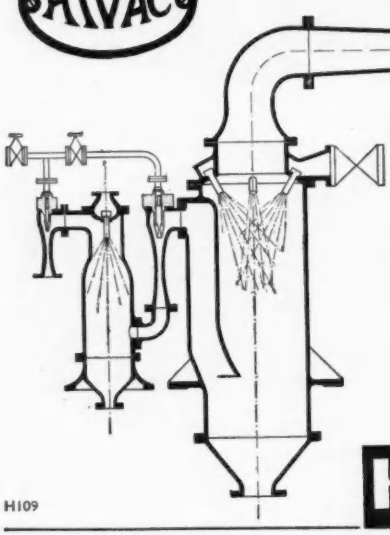

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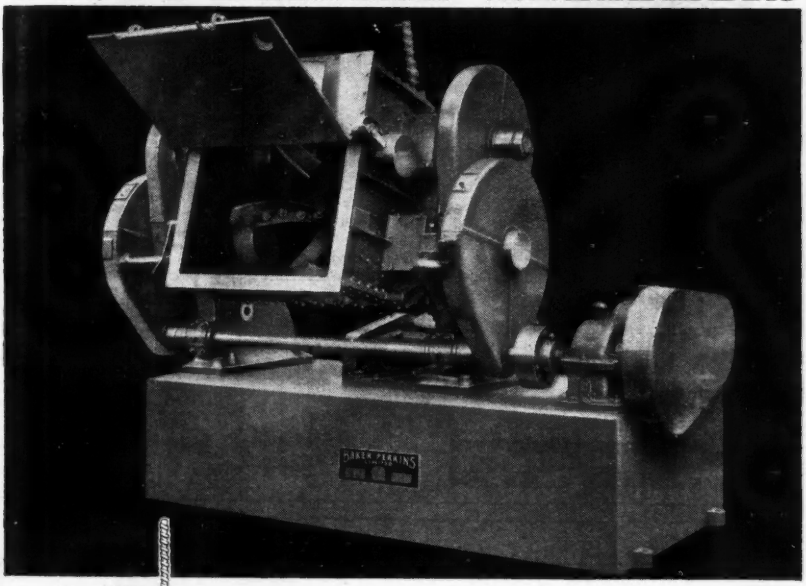

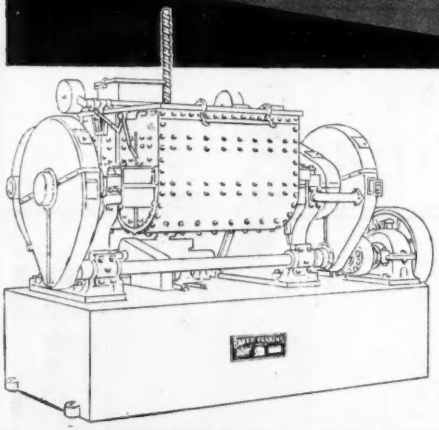

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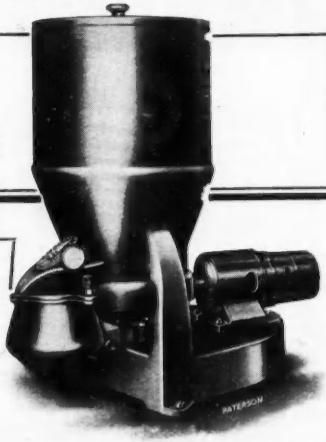

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The Government's Scientists

THE appointment last week of Sir Ben Lockspeiser to the secretaryship of the Department of Scientific and Industrial Research, in which Sir Edward Appleton has served with distinction for some nine years, has focused attention afresh on this extremely fruitful department and on the whole subject of the Government's participation in research. The news of the change of leadership at the DSIR is necessarily fraught with some regret arising entirely from the natural unwillingness to witness the departure of one under whose guidance the department has produced so many advances in scientific knowledge of the sort which is of immediate value to industry. There is fortunately every reason for confidence that his successor will show no less ability in balancing the department's programmes between the work of immediate utility for which there is so clamant a request and the more fundamental work on which the former is sustained. There are likely to be few vain regrets that Sir Ben Lockspeiser is not a chemist in the connotation which the word has for most organic chemists. The record of the Chemical Research Laboratory at Teddington could have been no more productive in its intensely practical fields even had the direction of DSIR been in the hands of one other than an eminent physicist. Its tradition will certainly not be diminished by the present change.

The appointment of the scientific advisor of the Ministry of Supply as the first link between the DSIR and the Government, represented by the Lord President's council, may be interpreted as another token of the administration's growing concern with scientific affairs Whatever criticisms are legitimately directed against the present Government, it must be said to its credit that it has supported scientific work and it has lost no opportunity of availing itself of the advice of scientists. The council of distinguished scientists which was set up by the Government, almost exactly two years ago, under the chairmanship of Sir Henry Tizard, "to advise The Lord President of the Council in the exercise of his responsibility for the formulation and execution of Government scientific policy," has exercised great powers in forwarding this policy. It was empowered to draw the attention of the Government to ways in which the application of scientific knowledge and experience could assist in the solution of the Government's problems, and certain specific problems were referred to the council. The first of these was the appropriate organisation for scientific research within the Government with special reference to research on Building and Fuel and Power.

Three main organisations have previously advised the Government: the DSIR, the Medical Research Council and the Agricultural Research Council serve the Government as a whole. Particular Government departments, such as the Ministries of Supply, Food and Works, initiate research

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into their peculiar problems. Industrial research has been aided through the research associations in which the DSIR has a voice. Later developments have been the increasing concern of civil departments with technical matters, bringing increasing responsibility for the application of research and scientific principles; while the nationalisation of great industries is throwing new responsibilities for scientific guidance and planning on the departments concerned. There arose, almost inevitably, a divergence of opinion on the part of Government departments as to the rôle they should play in all this. Some firmly believed in allowing the research councils complete freedom and independence, since only in this way would industry and others regard the results as impartial. That view has not found much favour with Government departments which have to use the results and have insisted that they should take a hand in the direction of the work. The advisory council very cleverly steered the middle course. It allowed that the department concerned should state which of its problems required research, in what order they should be tackled, where the investigations should be carried out and that they should be responsible for applying the results. On the other hand, the research councils and the various branches of the DSIR should continue to be free to undertake " background research " as they deemed fit, free from any control, but should undertake research at the request of the executive departments.

That seemed to dispose of the danger that the official research organisation might become departments within departments, but the anxiety to gain increased control of scientific work in industry was marked. Why should an executive department decide where the investigations should be carried out? The Ministry might well not know which was the best place. It would appear also that such a Ministry could cause existing research (even background research) to be stopped on the ground that certain research was required at once and there was no staff available to undertake other work. Is there not also too much emphasis on research that the Government requires to have done? Its problems may be quite different from those of industry, and there is a risk that the limited scientific research resources of the country are to be put at the disposal of Government departments to the exclusion of possibly more important work. Much as the value of Government interest in research is to be appreciated, it can be overdone.

The Advisory Council maintained that it would be wrong to concentrate responsibility for Government research on any single Minister, since each Ministry should

(*Continued on page 284*)

NOTES AND COMMENTS

The Sharing Policy

THERE has been more convincing evidence this week that the unconventional proposals for the transatlantic exchange of what Americans call "know-how" in chemical processes is more than a good natured ambition. The confirmation is contained in an account received from our New York correspondent on Tuesday indicating that facilities for production of fluorine chemicals in this country may soon be considerably enlarged by arrangement between the Imperial Smelting Co., Ltd., and the Pennsalt International Company, a division of America's Pennsylvania Salt Manufacturing Company. The British company is expected to make full use of technology supplied from Pennsylvania in the production of fluorine gas and its employment to yield a range of active and inert chemicals with potentially wide uses in industry. This, moreover, is not one of those long-term plans having little connection with urgent needs of the moment. The Americans, it is understood, intend to "prime the pump" by supplying the English company with fluorine and anhydrous hydrofluoric acid until such time as its own increased production resources, including initially an electrolytic cell from America, make such help unnecessary.

Fluorine Prospects

THIS Anglo-American project is, of course, not the only prospect of making available to chemical industries the highly productive possibilities of fluorine. I.C.I., Ltd., has for some time been operating pilot plants for the production of anhydrous hydrogen fluoride and three other fluorine products in the methane group, besides the plastic polytetrafluoroethylene, and are expected to begin large scale production now. These products, however, are only a token offering compared with the great range of products of fluorine chemistry on which I.C.I. performed much research during the war, as did some of their American counterparts. The fruits of that are now beginning to be reaped and, as this has all the appearance of being a British and American harvest, the co-operation now being proffered—not, of course, as a work of charity—holds out prospects of rapid and rewarding developments. The range of compounds which may be rendered available by the free use of fluorine is almost without number and its use as a substituent for hydrogen in hydrocarbons alone offers a field of new materials with highly promising characteristics. The present example of the new readiness to share technology is said to be the Pennsalt Company's contribution to the widening doctrine of reciprocal arrangements between American industry and other countries with the resources and initiative to profit by them—and with something to offer in return. Another token of that policy is the announcement of the simultaneous extension to the French Acieries Electriques d'Ugine of the use of the Pennsalt continuous process for the production of sodium subsilicates, which are among the most versatile of the newer detergents.

Metallic Fumes

THE responsibilities of producers and processors of base metals of several kinds seem to be becoming increasingly complex as a result of, among other things, the more lively recognition of the danger to health of some of the fumes produced, and the demand that they be reduced to much lower levels than has been common in the past. In Pennsylvania the disaster at Donora, which is widely attributed to the emission from a zinc smelter was an extreme case, which renders more understandable the violence of the crusade which some there have since been waging against this and other possible sources of atmospheric poisoning. Now the U.S. public health service has announced that a conference is to be called at Donora which will provide one of the most comprehensive studies of pollution ever held in the U.S.A. Its findings on the broader issues will be well worth study here. Experience of a similar problem in the U.K., although on a very much less serious scale, indicates that the elimination of noxious discharges from zinc works is not to be readily achieved without impairing efficiency of production. Difficulty in obtaining plant, for recovery or to substitute for the fume producers complicates this and most other project for reducing emission of chemical

or metallic matter. That the problem is being tackled energetically is made evident in the 84th Annual Report on Alkali Works (THE CHEMICAL AGE, *60*, 253 and this issue) which discusses some practical measures taken at a zinc works. The first consisted of reducing the amount of salt in the charge of horizontal retorts, which reduced fumes but impaired the efficiency of production, which depends upon observation of the sodium coloration of the flame at the condenser mouth. The willingness of the firm concerned to do all possible to conform with the higher standards now required is shown by the report that it has subsequently been working on an experimental furnace, employing instrumental controls and no salt. If the success of this is established the zinc firm will, it is said, convert the whole of its horizontal plant to the new principle.

Fellowship of Science

WHILE fear and suspicion are rife among nations and constitute the background to so much of the news, an evening spent in the company of the Society of Visiting Scientists—who met in London this week to discuss the international organisation of science—can be a refreshing and reassuring experience. That meeting reaffirmed what has always been accepted until now, that the fundamental knowledge gathered together by scientists and technologists should be available to people the world over, and that there cannot really be any national barriers between scientists who, after all, are only people of the same mind, living in different countries. In view of some of the criticism that has been levelled at UNESCO, it was good to learn of the very considerable help afforded to international science by the scientific branch, mainly through grants in aid, and to hear the appreciation expressed by representatives of other countries of the valuable work of the British members, Dr. Joseph Needham and Dr. Ronald Fraser.

Rejoinder from Germany

THE contention that Western German industries, and especially the making of scientific instruments, are being nursed in artificial and uneconomic conditions under allied control to undercut their counterparts here and elsewhere has elicited supporters and antagonists on a scale which reflects, rather surprisingly, widespread public feeling on the subject. The latest contribution, from the actual scene of operations, does not invalidate the warning recently given by Mr. J. E. C. Bailey, president of the Scientific Instrument Manufacturers' Association, but, as it controverts some of the facts quoted in support of it (THE CHEMICAL AGE, *60*, 144), it deserves to be heard. The witness (in a letter to *The Times* this week) is Mr. Henri Damur, managing director of Ernst Leitz, G.m.b.H., the Wetzlar manufacturers of microscopes and cameras, who have been mentioned as among those operating the cut price policy. He records that the Leitz works pays not 1s. 9d. but the equivalent of 2s. 9d. per hour and has in fact advanced its prices more than 100 per cent above 1939 levels. He also recalls the fact that the British industry has enjoyed for nearly 30 years the substantial protection afforded by Key Industry duty, and adds the acid observation that that circumstance has apparently not had the effect of lowering the cost and prices of British instruments.

THE GOVERNMENT'S SCIENTISTS

(*Continued from page 282*)

have a voice in its own work. The old cleavage between science and administration will be perpetuated. It is satisfactory, however, to recall that it was decided that each Ministry should employ its own scientific staff, "corresponding approximately to the operational research units attached to the Service Ministries and Commands during the war." That means the appointment of a Chief Scientific Officer, "Whose functions should be to advise generally on the scientific aspects of departmental policy, and in particular to define the problems calling for research, to make the necessary arrangements for its conduct and to watch the application of the results." Those have been among the responsibilities of Sir Ben Lockspeiser.

It is hard to avoid the feeling that, provided there is adequate scientific staff available for all this spate of Government research, in addition to private and industrial research, a happy solution has been reached. In effect it means that the Ministries will have to take their problems to a scientific advisor of presumably high qualifications and experience. Government research remains the province of scientists.

Low-Temperature Effects

U.S. Equipment for Extreme Ranges

A NEW laboratory especially designed for the study of properties at very low temperatures has just been completed by the (U.S.) General Electric Company at Schenectady, New York.

The new building, which cost $250,000, will be able to cover the range from room temperature to within one-tenth of a degree of absolute zero, according to Dr. Milan Fiske, of the laboratory staff.

Liquid Helium

Half the building space is taken up by two liquefying plants, where liquid helium and hydrogen will be manufactured for use in experiments, at the rate of two gallons and seven gallons an hour, respectively. The remainder of the building is devoted to experimental laboratories, large electric generators to run at low temperatures, and a machine shop for the maintenance work.

The method employed in the liquefiers is the regenerative Joule-Thompson cycle. Gases are compressed, fed through coils for further cooling, then passed through a chamber cooled by liquid nitrogen (for hydrogen) or liquid hydrogen (for helium), and finally expanded violently by being sprayed from a nozzle. Only about 20 per cent of the gases liquefy at the nozzle.

The tanks holding the extremely cold liquids and the entire liquefier circuits are enclosed in vacuum-insulated tanks and jackets. The hydrogen liquefier operates at a pressure of 2400 p.s.i., and the helium at 400 p.s.i.

Absolute Zero

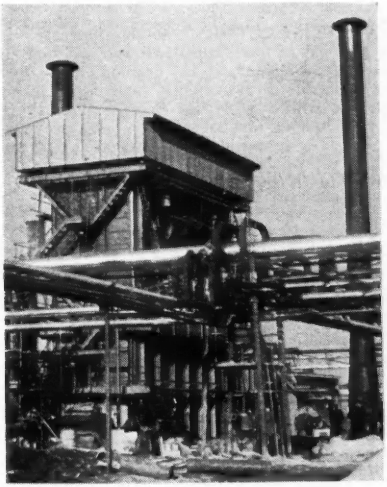
Some of the phenomena that occur at temperatures near absolute zero were described by Dr. Fiske, who said that below 2.19 degrees absolute, liquid helium becomes superfluid; its viscosity vanishes, and if it were set in motion like stirred coffee spinning in a cup, it would (theoretically) continue for ever. It is also a super-wetting agent which can creep up the side of a container and flow over the edge or work its way through exceedingly small orifices.

Extremely high electrical conductivity is another property that appears in some substances at low temperature—Columbium-nitride, for example.

Maximum safety for the research workers has been one of the principal considerations in the scheme of the new laboratory. Heavy shields separate workers from the liquefying plant and stored hydrogen; outer walls of the building are made up entirely of windows to relieve pressure in case of explosion.

Petroleum Chemicals

Production Begins at Partington



One of the Catarole cracking furnaces of Petrochemicals, Ltd.

PETROCHEMICALS, LTD., has announced that the first cracking furnace of its plant at Partington, near Manchester, employing the Catarole process has been taken on stream and is working satisfactorily.

From the beginning of operation, says the company, the quality of the products, both liquids and gases, has been up to specification and the yield of the olefinic gases which constitute the valuable part of the gaseous product is higher than expected. The throughput is in excess of the rated capacity. Delivery of gases to the Manchester Corporation Gas Works has commenced.

The Catarole process converts an essentially non-aromatic charging stock derived from petroleum into the full range of aromatic hydrocarbons, formerly obtainable only from coal tar, and into gases rich in olefins. The process, of which this is the first application, is entirely a British invention. It has been developed from the pilot plant stage by Petrocarbon, Ltd., which has also been solely responsible for the design, construction and erection of the large-scale plant. All royalties for the patents, etc., are British and no foreign currency has been required for materials, technology or design, the company records.

Chemical Production and Stocks

Higher Levels Reached in November–December

A SATISFACTORY small increase in stocks of basic chemicals and non-ferrous metals was generally maintained in the last two months of 1948, while production levels on the whole were also higher than those for November and December of the previcus year. These trends are indicated in the table reproduced below, compiled from the *Monthly Digest of Statistics* (No. 37, January, 1949).

The estimate of persons engaged in chemicals, coke ovens and by-product works in November, 1948, was 245,300 (168,900 men and 76,400 women), which was slightly higher than the previous month and the same period in 1947. Employment in the oils, greases, paints, varnish, etc., industries is given as 119,900 (83,200 men and 36,700 women), which shows a slight general increase over the previous month.

	November, 1948			November, 1947		
	Thousand Tons			Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	138.4*	131.0	—	129.2*	127.0*	—
Sulphur	—	24.4*	66.1*	—	21.7*	67.1*
Pyrites	—	20.6*	68.0	—	20.3*	75.0*
Spent oxide	—	17.2*	169.2*	—	17.4*	163.7*
Molasses (cane and beet)	49.0	24.0†	248.8	57.3	30.5†	208.5
Industrial alcohol (mil. bulk gal.)	1.7	2.21	8.45	2.05	2.92	7.68
Superphosphates	18.3	16.9	—	17.0	15.0	—
Compound fertilisers	155.9	111.6	—	131.0	99.4	—
Liming materials	—	558.9	—	—	478.9	—
Ammonia	—	6.58*	5.76	—	5.97*	4.28*
Phosphate rock	—	90.3	178.5	—	76.8	137.1
Virgin aluminium	2.46	16.4	—	2.25	13.6	—
Virgin copper	—	31.3	115.7	—	32.5	110.2
Virgin zinc	—	18.7	49.9	—	20.0	35.3
Refined lead	—	19.0	21.4	—	18.2	35.9
Tin	—	2.01	17.1	—	2.62	15.9
Zinc concentrates	—	11.7	24.0	—	14.4	60.0
Pig iron	176.0*	—	279.0*	165.0*	—	254.0*
Steel ingots and castings (including alloys)	282.0*	—	1,002.0	243.0*	—	775.0
Rubber : Waste collected	—	—	—	—	—	—
Reclaimed	0.47	0.49	4.15	0.49	0.49	4.56
Natural (including latex)	—	5.61	58.7	—	4.23	128.5
Synthetic	—	0.05	2.05	—	0.05	2.33

* December. † Distilling only.

ERP Allocations for 1949/50

CONGRESSIONAL hearings have begun in the U.S.A. on the moneys to be voted to the ERP (Marshall Aid) for the fiscal year 1949/50. The 19 "Marshall" countries submitted their individual programmes to the American authorities at the end of last year through the OEEC. The report by OEEC on these programmes—"Report to the Economic Co-operation Administration on the 1949/50 Programme, Vol. I"—is now available (HMSO, price 3s. net.)

The total sum of the national programmes is seen to be $4,650 million. The United Kingdom requirement in 1949/50 is for $940 million—a 25 per cent reduction on last year's help from America.

ECA world authorisations, in the last nine months of 1948, totalled $4,044,800,000. The United Kingdom's share was $1,093,400,000, states a report by the ECA mission to the U.K. The major commodities provided in 1948 by ECA to the U.K. included $147.2 million worth of non-ferrous metals, such as copper, aluminium, lead and zinc; $119.4 million worth of petroleum and petroleum products; and $114.4 million worth of machinery and machine tools.

The total authorised for the U.K. was almost evenly divided between agricultural and industrial commodities. More than $529 million was for industrial items, such as fuel, machinery, metals, timber, chemicals, pulp and paper, and other raw materials. Individual items making up the amount authorised for the U.K. (from April 3 to December 31, 1948) included: petroleum and products $119.4 million; non-ferrous metals and products $147.2 million, made up of copper $49.9 million; aluminium $43 million; lead $23.6 million; zinc $27 million; other non-ferrous metals $3.6 million; chemicals and related products $22.8 million; non-metallic minerals $8.8 million; machinery $114.4 million.

RUSSIA SHORT OF DYESTUFFS

State Control Prevents Patent Publication

INTERESTING light was cast on the Russian dyestuffs and calico printing industries and on the patenting of inventions, there and here, in a lecture delivered to the Society of Dyers and Colourists at Bradford last week by Prof. Herbert Levinstein. He revealed a number of facts on the present situation.

Dr. Levinstein said: "In Russia, the development of the dyestuffs industry occupies an important place in the current five-year plan. The industry, as a whole, is scheduled to produce in 1950 one and a half times as much as before the war. The target is 43,000 tons, and the range is to be much extended. Special emphasis is laid on the increased production of vat dyes.

Aniline Dyes

"Two new aniline dye works are to be erected, of modern design, and with up-to-date processes, doubtless acquired in part from German chemists. The Russians claim that in 1940 they ranked third in the world's production of dyes, which is quite likely, but tonnage figures for dyestuffs are misleading, unless the strength is known.

"For instance, before the Tito crisis, samples of Russian dyes, ordinary direct colours, were sold in Jugoslavia in paste form of 10-20 per cent concentration.

"To-day, there are no exports by Russian calico print works, which were at one time among the largest in the world, and unsurpassed for the charm and quality of their designs.

"It is clear that there is a great shortage of dyes, both in quantity and quality in Russia. This accounts for the drab and dreary clothes of the population. We need not doubt, however, that this position is being remedied and that in due time, when they have satisfied urgent wants, they will proceed with their second objective, the discovery of new dyes and improved processes."

The Chemical Industry

Referring to the effects of state ownership on the existing patent law, Prof. Levinstein had this to say: "Nationalisation of the chemical industry, wholly or in part, is in the air here. It is in being in Russia and the vast area behind the Iron Curtain, with a population of about 350 millions. With the Communist victory in China, it may well include shortly not less than one-third of the world's population.

"Sir Stafford Cripps, himself a distinguished patent lawyer, when at the Board of Trade, appointed a committee to report on amendments to the present law and a Government Bill is shortly to be introduced. The grant of a monopoly to the inventor for a term of years is thus admitted by the Government to be still the best method of encouraging invention.

"Nationalisation, however, destroys the usefulness of patents for this purpose. Patents are published for all to read, but Russia and its satellites publish none of their inventions. The fruitful flow of research results and patents which formerly percolated the world like sap in living nature stops there. Russia takes all and gives nothing.

"Apart from this aspect, a private person is at a great disadvantage in offering his inventions to a Government department.

"Mr. A. M. Low, president of the Institute of Patent Agents, in *The Times* of December 6, pointed out that Government committees are often composed of persons other than Government officials. He referred to an inventor who called on a Government department concerning his ideas, which had been covered by a provisional patent, fondly imagining that they were only known to himself, and was told that a copy of his application had been with the department for some time.

"He added that this power negatives the purpose of the Patent Act.

Government Departments

"People who represent a Government department may themselves have taken a provisional secret patent for a process. An inventor, not knowing this, may in good faith show them his own invention for a similar but better method and find some years afterwards, when the complete patent is published, that the Government representatives included his invention in their complete specification.

"Lastly, it is not easy for an inventor to find out if an invention openly refused by a Government department has not secretly been wholly, or partly, adopted.

"For these, and other, reasons, the Patent Law is unlikely in its present form long to survive nationalisation of industries and the probability is that this will restrict private invention."

Wood Chemistry in Austria.—The Austrian authorities are planning to establish a wood chemistry institute in Graz, Styria (British zone). Work is to commence this Spring.

ATOMIC ENERGY REPORTS

New Additions to Titles Available

A NEW long series of British "declassified reports" on atomic energy and some related subjects has just become available, having been released for general use by the Ministry of Supply. Such reports can be obtained at once from H.M. Stationery Office in the form of enlarged prints (9 in. by 7 in.) from microfilm and should be identified by their BDDA numbers and short titles. Details of reports (to BDDA 73) appeared in THE CHEMICAL AGE, *57*, 561-562 and (99 to 121) in *58*, 110. The new data available comprise the following:

BDDA No.	Report No.	Titles and Authors	Date	Price	Post Paid
122	Br. 48A	Note on the radiations and isotopic assignment of the 50-year radio-element 94. N. Feather	23/ 8/42	5s. 4d.	(5s. 7d.)
123	Br. 61	Physical properties of fluorocarbons. H. S. Arms.	24/10/42	8d.	(10d.)
124	Br. 62	Vapour pressure of bromoform. H. S. Arms	24/10/42	8d.	(10d.)
125	Br. 64	Tube Alloys Project. Data Sheets. A. H. Turnbull.	19/10/42	18s. 0d.	(18s. 4d.)
126	Br. 65	Salts of U—Sir Norman Haworth.	1942	1s. 4d.	(1s. 7d.)
127	Br. 67	A chemical method for the detection of leaks in vacuum apparatus. D. J. Alner.	11/42	3s. 4d.	(3s. 7d.)
128	Br. 68	Specific heat of C_7F_{16}. H. S. Arms.	3/12/42	8d.	(10d.)
129	Br. 70	Uranyl Nitrate.		3s. 4d.	(3s. 7d.)
130	Br. 77	Report on the electrolysis of used U chlorides for metal production. Drs. Stacey and Wilkinson.	9/41	3s. 4d.	(3s. 7d.)
131	Br. 92	Determination of vapour pressure of UF_6 between 20 and 30° C. C. B. Amphlett and L. F. Thomas.	26/8/41	1s. 4d.	(1s. 7d.)
132	Br. 93	Determination of the vapour density of U-hexafluoride at 30° C. C. B. Amphlett, L. F. Thomas.	5/9/41	3s. 4d.	(3s. 7d.)
133	Br. 110	Report on the reconversion of hexafluoride to metal. Part I. Conversion of U-hexafluoride to U_3O_8. C. B. Amphlett, L. F. Thomas.	10/10/41	1s. 4d.	(1s. 7d.)
134	Br. 121	The vapour pressure of heavy water. W. A. Bell.	15/5/42	4s. 0d.	(4s. 3d.)
135	Br. 136A	The total neutron collision areas of some heavy metals. E. Bretscher, E. B. M. Murrell.	1/43	1s. 4d.	(1s. 7d.)
136	Br. 140A	The production of 9 kg. of sulphur hexafluoride. A. M. Dawson, A. J. Lowe.	11/3/43	4s. 8d.	(4s. 11d.)
137	Br. 160	Tables of capture cross-section for thermal neutrons. L. Kowarski.	3/42	3s. 4d.	(3s. 7d.)
138	Br. 162	Construction of G-M counters. N. Veall.	11/12/42	2s. 0d.	(2s. 3d.)
139	Br. 165	A flowmeter for small gasflows. A. F. Brown.	20/1/43	6s. 0d.	(6s. 3d.)
140	Br. 176	The production of UC_{14} from U_3O_8 Drs. Stacey and Wilkinson.	28/2/42	8d.	(10d.)
141	Br. 177	On the preparation of organic fluoro-derivatives. W. K. R. Musgrave, H. G. Bray.	28/2/42	1s. 4d.	(1s. 7d.)
142	Br. 178	Pressure-density relationship for UF_6. L. F. Thomas.	31/3/42	8d.	(10d.)
143	Br. 180	Organic fluorides. Dr. F. Smith.	31/5/42	2s. 0d.	(2s. 3d.)
144	Br. 183	Investigation of the pressure-density relationship for U hexafluoride. L. F. Thomas.	1/5/42	8d.	(10d.)
145	Br. 190	Deuterium exchange reactions. H. E. Eduljee.	8/4/43	2s. 8d.	(2s. 11d.)
146	Br. 196	Orifice plate calibrations. Report No. 1. G. A. R. Hartley, R. W. Morton.	30/5/43	6s. 0d.	(6s. 3d.)
147	Br. 208	Empirical formulae for the boiling points of the fluorocarbons. H. A. Skinner.	6/5/43	11s. 4d.	(11s. 7d.)
148	Br. 233A	The action of HF upon halogenated (chloro) hydrocarbons. Direct replacement of Cl by F. Dr. F. Smith, Mr. W. K. R. Musgrave.	3/4/43	2s. 0d.	(2s. 3d.)
149	Br. 293	Preparation of benzotrifluoride. J. Chapman, W. B. Whalley.	15/9/43	2s. 8d.	(2s. 11d.)
150	Br. 304A	Separation of hydrogen-carbon dioxide mixture by centrifugal action of a jet. J. A. V. Fairbrother.	22/9/43	10s. 8d.	(10s. 11d.)
151	Br. 311A	Sensitivity of a fast neutron counter for a near source. N. Feather.	11/12/42	6s. 0d.	(6s. 3d.)
152	Br. 319A	The chemical and physical properties of the fluorocarbons. A. J. Rudge, N. F. Sarsfield.	18/10/43	9s. 4d.	(9s. 7d.)
153	Br. 329	An attempt to forecast some physical constants for selected fluorocarbons. A. J. Rudge.	6/11/43	14s. 0d.	(14s. 3d.)
154	Br. 311	Fluorotoluenes. Part I. Experiments on the preparation of benzotrifluoride. J. Chapman, W. B. Whalley.	4/11/43	8s. 0d.	(8s. 3d.)
155	Br. 360	The elementary fluorides and their use as fluorinating agents—a general review (June, 1943). N. F. Sarsfield, H. A. Skinner.	13/12/43	£1 7s. 4d.	(£1 7s. 8d.)
156	Br. 380	Fluorotoluenes II. Nuclear fluorinated toluenes. C. W. Suckling.	10/2/44	9s 4d	(9s. 7d.)
157	Br. 381	Fluorotoluenes. Part 3. Nuclear fluorinated benzotrifluorides. C. W. Suckling, W. B. Whalley.	14/2/44	5s. 4d.	(5s. 7d.)
158	Br. 420A	Notes on the production of fluorocarbons and related compounds at Weston Point. A. J. Rudge.	3/5/44	2s. 8d.	(2s. 11d.)

(*Continued at foot of page* 290)

RADIOACTIVE WASTES

Safe Disposal Not an Insuperable Problem

THERE is no real cause for concern on the part of residents in other large population centres located near atomic energy plants and laboratories, that dangers of irradiation poisoning are necessarily inherent in the wastes discharged from such installations.

This is the substance of a special report issued by the United States Atomic Energy Commission following a two-day seminar in which the disposal problem, especially as it relates to facilities near big population centres, was thoroughly explored by a number of leading members of the sanitary engineering and water works engineering professions. These discussions form part of a continuing effort by the Atomic Energy Commission to maintain close liaison with public health and safety officials on mutual problems arising out of the national atomic energy programme.

In his introductory remarks at the first seminar meeting, David E. Lilienthal, chairman of the AEC, pointed out that the consideration of radioactive waste disposal and other atomic energy problems must be discussed from the viewpoint that " we have to learn to live with radiation."

" Handling the waste disposal problem is a part of learning how to live with radiation," he said. " The way we have learned to live with unfamiliar things before was to learn as much as we could about them. Radiation is just as much a natural phenomenon as anything else. The fact that we have by intelligence multiplied it does not change that fact. Just as we were able by our intelligence to conquer other things, we will conquer this as well."

Many Aspects

Among the topics discussed at the seminar were the types of activities in the national atomic enrgy programme leading to the production of radioactive wastes; the effects, controls, tolerances and methods of measuring radioactivity; the production, distribution, use and controls of radioisotopes; health problems in atomic energy activities; current methods for disposing of gaseous, liquid and solid radioactive wastes; and an appraisal of sanitary engineering problems in the atomic energy industry.

In discussing health problems in atomic energy activities, Dr. Shields Warren, director, Division of Biology and Medicine of the AEC, indicated that it is possible to detect radioactivity at levels far below those dangerous to humans and that the problems dealt with are not unknown hazards. So far as external radiation is concerned, he said, there is no hazard which proper shielding and proper application of known techniques of waste disposal cannot deal with.

Internal radiation comes from radioactive materials which are absorbed by the body after having entered it through the lungs or gastro-intestinal tract. To prevent radioactive materials from being absorbed by human bodies is the prime objective of the radioactive waste disposal programme, and to the best of our knowledge the precautions at atomic energy sites were giving adequate protection.

Tolerances

Dr. Austin Brues, director of Biology and Medicine, at the Argonne National Laboratory, Chicago, discussed permissible limits and tolerances of radioactivity. Tolerances for radioactivity, he said, were determined in the same way as tolerances for chemical or bacteriological hazards through experimental research and observation of individuals who have worked with X-ray or been victims of radium poisoning over the past 50 years. In the matter of external total body radiation, the standardised tolerance level was one-tenth röntgen per day. That referred to persons exposed to radiation continuously, such as workers with X-ray or atomic energy. Persons who no not receive continuous exposure can tolerate single doses of radiation of many röntgens without detectable damage.

Describing atomic energy installations and processes which are sources of radioactive wastes, Roger S. Warner, director of Engineering, and Arthur V. Peterson, of the Production Division, AEC, said that the amounts of waste materials produced at these sites vary by factors of several million. The larger research laboratories, such as the Argonne National Laboratory, the Brookhaven National Laboratory, and the Oak Ridge National Laboratory, produce considerably greater quantities of radioactive materials, but the low permissible limits for radioactivity discharged into soil, air or water are usually met through techniques of dispersion and dilution, and use of normal industrial decontaminating devices such as filters and scrubbers.

The radioactivity produced at the great atomic energy production centres and particularly at Hanford, Washington, where uranium-235 and plutonium are produced, are of another order of magnitude. Even at these centres many types of wastes of

low levels of radioactivity are handled in the same fashion as at other laboratories.

Very high level wastes, however, are held at the site until the radioacivity decays and the material is reprocessed for its highly valuable components. At present Hanford's waste by-products are being stored in great underground tanks until means for ultimate disposal are developed. That problem awaits solution.

After radioactive wastes from the Oak Ridge, Tennessee, plants of the Commission were discharged to the Clinch River, the level of radioactivity in that river was found to be considerably less than that in many of the mineral waters widely used in the United States for drinking, reported Dr. Karl Z. Morgan, director of the Health Physics Division, Oak Ridge National Laboratory. The amount of radioactivity contributed from all Oak Ridge operations to the atmosphere of the neighbouring area was less than the added cosmic radiation exposure one receives in going from sea level to Denver at 5000 ft. elevation, he added.

So far as the Brookhaven National Laboratory is concerned, it was pointed out that by restricting the operation of the atomic pile there to certain wind conditions, and by the burial of "slugs," or metal containers of irradiated products, the area in general and the near-by water supply sources in particular were protected. "The pile is to be controlled by the meteorological conditions," Dr. Warner said. "It won't operate when there is inadequate wind for dilution. While waste liquids might get into your water supply system, the tolerance levels have been set extremely low, practically at the resolution of the instruments."

At Brookhaven there will be no chemical processing of slugs, which will be stored underground. Since the pile will be air-cooled, not water-cooled, liquid wastes will not pose a serious problem.

In summarising the sanitary engineering problems connected with atomic energy, Dr. Abel Welman, head of the Department of Sanitary Engineering, John Hopkins University, predicted that the sanitary engineer and the water and sewage plant operators in the future would take on the function of protecting the water supply and the atmosphere of communities against the hazards of contamination by radioactive wastes, just as they now protect communities against air and water pollution of other types. He urged that the biologists, physicists and physicians should reach agreement on permissible concentrations of radioactivity in soil, air and water, and supply these data to the sanitary authorities.

ATOMIC ENERGY REPORTS (*Continued from page 288*)

159	Br. 463	Radiative capture of spontaneous fission neutrons in spheres of different size. N. Feather.	4/48	2s. 8d.	(2s. 11d.)
160	Br. 497	The ultra-violet absorption spectra of some fluorinated hydrocarbons. Miss D. Grove.	1/9/44	3s. 4d.	(3s. 7d.)
161	Br. 504	Addendum to Br. 315 (BDDA 114). Further remarks on the correction for self-absorption in 3-ray measurements. N. Feather.	5/9/44	4s. 8d.	(4s 11d.)
162	Br. 527A	The refining of fluorocarbons. January 1943–March 1944. N. F. Sarsfield.	6/11/44	17s. 4d.	(17s. 8d.)
163	Br. 561A	Vacuum testing. The spectroscopic method of leak detection. A. H. Turnbull, R. Lipscomb.	16/2/45	7s. 4d.	(7s. 7d.)
164	Br. 613	Fluorokerosene—production by the vapour phase CoF_3 process. Part I. Laboratory scale work. A. M. Dawson.	14/6/45	8s. 0d.	(8s. 3d.)
165	Br. 674	Preliminary report on the number of neutrons emitted by a beryllium-radium photo-source. E. Glueauf.	20/12/45	3s. 4d.	(3s. 7d.)
166	Br. 689A	Fluorocarbons—Physical properties and composition. Part 5. Refractivity and density-revision of standard factors. N. F. Sarsfeld.	15/2/46	4s. 0d.	(4s. 3d.)
167	Br. 690	Fluorocarbons. Physical properties and composition. Part 3. Boiling Points. N. F. Sarsfield.	18/2/46	16s. 0d.	(16s. 4d.)
168	Br. 692	Fluorokerosene by the vapour phase CoF_3 process Part 2. Semi-technical work. D. F. Barratt.	20/2/46	11s. 4d.	(11s. 7d.)
169	Br. 693A	Fluorocarbons. Physical properties and composition. Part. 4. Molecular weights. N. F. Sarsfield.	21/2/46	4s. 0d.	(4s. 3d.)
170	Br. 700A	Fluorocarbons. Physical properties and composition. Part. 2. Refractivity and density-compounds of C, F, H and Cl. N. F. Sarsfield.	18/3/46	£1 1s. 4d.	(£1 1s 8d.)
171	Br. 780	Trichloroacetyl peroxide. Investigation of preparation and stability. J. T. McCombie.	12/5/47	2s. 0d.	(2s. 3d.)
172	BI.54A	Fluorolubes from freon 113. A digest of U.S. reports on the Miller process N. F. Sarsfield.	8/2/45	3s. 4d.	(3s. 7d.)
173	BI 133	Specific refraction of CF_2=CFCl polymers. N. F. Sarsfield.	19/6/45	1s. 4d.	(1s. 7d.)
174	BI. 136A	Preparation of lubes by polymerisation of trifluorochloroethylene. R. G. R. Bacon.	15/5/47	9s. 4d.	(9s. 7d.)
175	MS. 7	Effect of packing on critical size. K. Fuchs.		1s. 4d.	(1s. 7d.)
176	MS. 7A	Effect of packing on the critical radius of the sphere. K. Fuchs.		6s. 8d.	(6s. 11d.)

PREVENTING FUME EMISSION

Recommendations from 84th Alkali Report

PROGRESSIVE improvement has been noticeable in the minimising of the production of fumes during the manufacture of carbon bisulphide. Nevertheless, the plant at one of the factories was the scene of an accident in January, 1947, when an operator was found dead, having been gassed with carbon bisulphide vapour and hydrogen sulphide, states the 84th Annual Report on Alkali, etc., Works, by Chief Inspectors, 1947. (THE CHEMICAL AGE, *60*, 253.)

Certain hot water seals on the vapour lines from the retorts were found to be empty and the indications were that the worker was preparing to replenish them when he was overcome by the fumes that would be escaping, says this report. To avoid the possibility of similar accidents recurring the hot water seals have been deepened and furnished with a continuous supply of hot water with the overflow running to waste.

The use of carbon bisulphide continues for the cold curing of rubberised fabrics and only at one works has recovery of this solvent been practised.

It is interesting to note that at some works the use of carbon bisulphide has been abandoned in favour of a special petroleum spirit of relatively high boiling point which, it is said, does not adversely affect the cure or the quality of the proofing. It may be that the availability of this alternative solvent may lead to an agreement whereby the use of carbon bisulphide in this industry will be prohibited.

Such a result would be welcome because the whole of the carbon bisulphide used at present is eventually discharged to atmosphere, save at one particular factory where it is recovered by adsorption on active carbon. Carbon bisulphide is a very volatile, inflammable and toxic substance and its recovery is attended by danger unless conducted by highly skilled personnel such as is available at this latter factory.

Reduction of Fumes

As regards conditions in zinc works there was, it is stated, little concrete progress to report for the year 1947, but the prospects were promising. During the year attempt was made to reduce the fume emission from the horizontal retorts in the factory about which complaints had been received during 1947, by diminishing the amount of salt in the charge.

A small reduction was effected but further reduction was found to lead to operational difficulties owing to the lessening intensity of the sodium coloration of the flame at the condenser mouth, upon which visual evidence the heating of the furnace is controlled during the progress of the distillation. Moreover, the efficiency of zinc recovery fell off markedly and further advance along these lines has had to be postponed so far as commercial operations are concerned.

In addition to the experiment now in hand, the research department of the factory in question is actively engaged on other methods for zinc distillation and pilot plant experiments are in progress.

Varying Lead Tolerances

During the year 1947 under review, samples were taken at all registered lead works and, these having been analysed at the Government laboratory, an estimate was made of the total weight of lead fume escaping to atmosphere in unit time. The total number of separate processes under inspection was 1843, compared with 1913 in 1946. With a view to formulating standards on which to base the "best practicable means" requirement of the Alkali Act it was decided in the first place that registered lead works should be classified into three broad categories, *i.e.*, small, medium and large works.

More efficient means of trapping lead fumes would be required at large works than at small ones but it was realised that, even so, the total amount of escape would be greater from the large works. As a working basis it was decided to adopt the following concentrations of lead as the maxima which should be permitted in the waste gases discharged to atmosphere.

Small works	...	0.10 grain	per cu. ft
Medium works	...	0.05	,, ,,
Large works	...	0.01	,, ,,

The total quantity of lead fume to be discharged from any one works should not exceed from

Small works	...	200 lb.	per week
Medium works	...	400	,, ,,
Large works	...	1000	,, ,,

On the above basis, several works were found to be in default, *viz.*, three small, two medium and eight large works, but in each case it seemed that compliance with the proposed standards should be possible.

This class of work became registrable by virtue of Alkali Works Order, No. 1299 in

1939; 1947 afforded the first opportunity of making a thorough review of the conditions which, in the opinion of the Chief Inspector of Alkali Works, are reasonably satisfactory. Special attention will be given to those cases at which some improvement in lead fume arrestment is desirable.

Test Case

Statistics in regard to sulphuric acid works are given. These figures exclude Government factories except in those cases where acid has been produced for normal trade purposes. They show that in 1947 there was a decrease in production of some 3000 tons compared with the production in 1946 (1,114 million tons), but the proportion made in chamber plants continued to decrease and was only 40 per cent of the total at the end of 1947. Thirteen instances were recorded when individual escapes were found to be in excess of the statutory limit of 4.0 grains as SO_3 per cu. ft. The infractions are tabulated, an example being that at one specified works the first test gave a figure of 18.00 grains as SO_3 per cu. ft., the repeat test giving 1.8 grains. In this instance the interval between tests was five hours; the plant was temporarily overloaded.

Although there was a slight fall in the total production of sulphuric acid in 1947, there was an increase of 57,000 tons in the amount produced by the contact process. Reference was made to the standards in connection with new contact plants, the attainment of which is regarded, for purposes of the report, as satisfying the best practicable means as required in Section 7 of the Alkali Act. The main item of these standards is that the escape should possess an acidity corresponding to not more than 2 per cent of the sulphur burned subject always to an overriding condition that the total acidity of the undiluted escape shall not exceed the equivalent of 4.0 grains of sulphur trioxide per cu. ft.

Other items are that the waste gas should be discharged at as high a level as is practicable, that it should be substantially free from acid mist and that provision should be made for ensuring that the period of potential high escape during a start-up should be reduced to a minimum. It is also desirable that the escape should be through a chimney carrying, for example, boiler gases, so that there will be good dilution.

It is believed that these standards are attainable in a plant of modern construction involving the employment of 4-stage conversion. If they are not attainable, then consideration must be given to some form of gas washing to reduce the acidity of the escape.

The foregoing has reference to plants employing brimstone or pyrites as the source of sulphur supply. It is appreciated that if it becomes necessary to use spent oxide, coal brasses, etc., the implied conversion efficiency of 98 per cent is scarcely possible owing to the difficulty of maintaining a suitable sulphur dioxide/oxygen ratio.

In such cases we should doubtless have to make some concessions but it would be necessary to consider each case on its individual merits.

The arithmetic average of all official tests at contact processes was 3.4 grains compared with 3.1 grains in 1946. The figure is to some extent illusory in that it is not adjusted in accordance with the scale of production at each works. It is inclusive of the relatively low escapes from processes at which washing is practised and in view of this fact, there can be no doubt that other contact plant escapes are unduly high.

PRESS SERVICE TO INDUSTRY

THE annual dinner and dance of Benn Brothers, Ltd. (proprietors of THE CHEMICAL AGE) and Ernest Benn, Ltd., was held on February 11 at Grosvenor House, Park Lane, London, the attendance numbering about 370. Mr. Glanvill Benn, chairman of Benn Brothers, Ltd., who presided, and Mrs. Glanvil Benn welcomed the guests.

Proposing the toast of "The Firm," Mr. John Stonard, chairman of the Furnishing Trades' Benevolent Association, said there were many contacts made by Benn Brothers through their journals throughout the British Isles and in lands beyond the seas who would join with him in wishing continued success to the firm.

Mr. John Benn, responding, said the firm consisted of a fine group of people working together of their own free will for a common purpose. The whole basis of the firm's prosperity rested on pleasing the customer and the prosperity of the country rested on the fact that there were so many progressive firms carrying the burdens of the day and keeping alive the spirit of self-help and enterprise that had made the country so great in the past.

Among other speakers, Mr. E. H. Gardener, immediate past deputy president of the National Farmers' Union, spoke in praise of the quality of the trade Press service available to industrialists and the business classes in this country. He was in no doubt about the importance of the Press in keeping before the public facts vital to the national prosperity, and remarked—even in a planned State there could be a remarkable lack of planning.

OXIDATION REACTIONS OF METHANE

Fruits of Recent French Research

THE conversion of methane into synthesis gas becomes increasingly important, and much work is being done not only in the U.S.A. but also in France and Italy, though little so far appears to have been reported. In the U.S.A. more than 40 per cent of synthetic ammonia production is based on natural gas or methane. In France already plants have been erected, or are in course of erection, in which methane will be used for various syntheses, either from coke oven gas or from natural gas, such as that of Saint-Marcet, thus continuing work which was pioneered in that country some twenty years ago.

In *Chim. et Ind.*, 1948, *60*, 550-559, J. Meunier reports recent French research in this field, after noting the earlier work of Eichner and co-workers (*Comptes Rend.* 1944, *218*, 621) and of Reitmeier and others in America (*Ind. Eng. Chem.*, 1948, 601-7, 620-6). He gives first some preliminary data on oxidation and the reactions which may be either endothermic or exothermic, also graphic presentations of the Gibbs triangle type which are more simple and suggestive than hitherto.

Conditions of equilibrium are defined with considerable simplifying of analysis through suitable choice of reactions and parameters. The results thus found are applied to a study of processes of the exothermic type, using oxygen only or in admixture with steam or carbon dioxide. The endothermic type of reaction is also discussed briefly, and also the gaseous low-methane mixture.

The Reactions

The bimolecular reaction with minimum oxidation is

(1) $CH_4 + H_2O$ vap. $\rightarrow CO + 3H_2 - 49.3$ cal.

A part of the CO is in turn oxidised by the water (vap.) in accordance with the water gas reaction or CO conversion

(2) $CO + H_2O$ vap. $\rightarrow CO_2 + H_2 + 9.8$ cal.

If all the CO formed could be thus oxidised, which, as will be seen, is statically impossible, there would be as resultant of the two reactions maximum oxidation

(3) $CH_4 + 2H_2O \rightarrow CO_2 + 4H_2 - 39.4$ cal.

The minimum oxidation reaction, using CO_2 is bimolecular

(4) $CH_4 + CO_2 \rightarrow 2CO + 2H_2 - 59.1$ cal

A part of the hydrogen formed is oxidised by CO_2 according to (2) inverted Oxidation of all the hydrogen would correspond as before to maximum oxidation, also statically impossible

(5) $CH_4 + 3CO_2 \rightarrow 4CO + 2H_2O - 78.7$ cal.

Of the above reactions, two only are independent. It may be readily seen that (1) results from association in equimol. proportions of (2) and (4). The general reaction of water vapour or carbon dioxide with methane depends on the varying composition of (1) and (2) the latter being suitably chosen, thus depending on one parameter only.

Methane Combustion

Further light on methane combustion has been thrown by recent work of Audibert in France (*Ann. Mines*, January, 1947, 44-54; *Bull. C.F.R. Charb.*, November, 1947, etc.); and by Van Tiggelen in Belgium (*Bull. Soc. Chim. Belg.*, 1946, *55*, 201-244).

It has been found that methane combustion takes place in chain reactions yielding formaldehyde or other oxidised compounds, breaking up again into hydrogen and CO. These again are oxidised by excess oxygen.

In regard to slow combustion of methane Audibert distinguishes: (a) heterogeneous reactions taking place in contact with hot solids and giving rise directly or indirectly to formation of CO_2 and steam; and (b) methane-oxygen reactions yielding a very unstable compound, methyl-hydroperoxide which, in contact with solids, decomposes into water and formaldehyde and then into water and CO_2. With controlled combustion in the presence of a contact mass, there is no doubt this latter takes place. Thus we have total or maximum combustion:

(6) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + 191.8$ cals.

All the oxygen is used but only a part of the methane, since this is in excess. This excess therefore reacts with the water and CO_2 in accordance with equations above. Thus we have finally a mixture of hydrogen, carbon oxides, and water vapour, definable as a function of two parameters, as the system comprises three independent reactions. If the excess methane is sufficient to account wholly for the water and CO_2 we have minimum combustion, thus

(7) $CH_4 + O_2 \rightarrow 2CO + 4H_2 + 17$ cals.

Hitherto it has been supposed that no free carbon is formed. If carbon is present it is necessary to assume a fourth independent reaction which may be that of methane dissociation:

(8) $CH_4 \rightarrow C + 2H_2 - 17.9$ cal.

or the reversed Boudouard reaction:

(9) $2CO \rightarrow C + CO_2 + 41.2$ cals.

It may be easily verified that (9) results from (2) and (8) and (1) reversed.

Without secondary reactions, the three independents (6), (1), and (2) suffice to account for all the possible cases of methane oxidation by water vapour, carbon dioxide,

and oxygen. If, per mol. of methane decomposed, m is the number of oxygen mols. used, and p is the number of mols. of water decomposed (positive) or formed (negative), m may then have any value between 0 and 2, and p any value between -2 and 2. The general reaction may be expressed as a function of these two parameters by the equation:

(10)

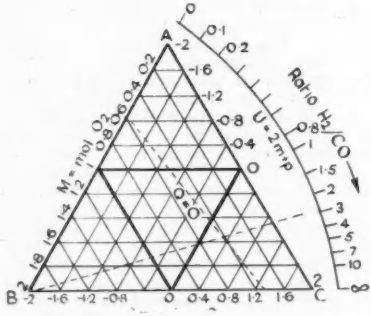
$$CH_4 + mO_2 + pH_2O + (1-2m-p)CO_2 = (2-2m-p)CO + (p+2)H_2$$

transferring those bodies with negative molecular coefficients.

Graphic Representation

The Gibbs triangle can be effectively used for graphic representation, using the three reactions (5), (6), and (3) to form (10). These three have the following coefficients in terms of the parameters m and p:

(5) $\frac{1}{4}(2-2m-p)$; (6) $\frac{m}{2}$; and (3) $\frac{1}{4}(p+2)$.



Q=O separates exo—from endothermic

Fig. 1

In the triangle, Fig. 1, the points A, B, and C, represent respectively (5), (6), and (3). Any reaction resultant may be represented by the point M, of which the distances to the sides BC, AC, BA will be respectively equal to the coefficients given. The diagram relates to one mol. methane, and indicates the following:

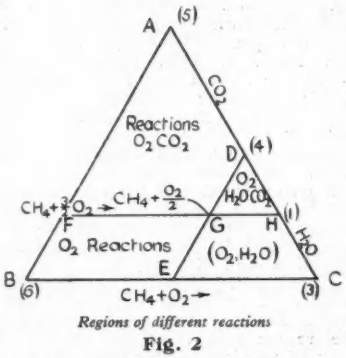
1. On a parallel to AC the amount of oxygen m is constant, and thus also the ratio $4-2$ of vol. of gas used $(CO+H_2)$ to vol. methane converted, and ratio $\frac{4-2m}{m}$ of gas vol. used to oxygen consumed.

2. On a parallel to AB, the amount of water, p, decomposed or produced is constant, also the number of mols. of hydrogen produced, $p+2$.

3. On a parallel to BC $u = 2m + p$ is constant, also the number of mols. of CO produced $2 - u$, and the number of mols. of CO_2 produced $(u-1)$ or consumed $(1-u)$. The ratio CO_2/CO in the end gas is also constant when the initial mixture contains no CO_2.

4. On a line from B the ratio H_2/CO of the end gas is constant. The value of this ratio for any point M is given by P.

5. The representative points of reactions for which the enthalpic variation is zero are on a line (broken in Fig. 1) separating exo- from endo-thermic reactions. On a parallel to this line the heat of reaction Q per mol. of methane oxidised is constant.



Regions of different reactions

Fig. 2

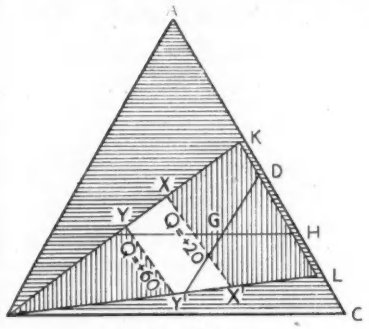
It is to be further noted (Fig. 2) that the lines FH ($u=1$) and ED ($p=0$) divide the triangle into four zones corresponding to the various reactions in which oxygen takes part. Those where this is not the case are shown by line AC. The points H, D, G, correspond to the three reactions of minimum oxidation—(1), (4), and (7)

The possible oxidation reactions are tabulated, showing values of m and p and their reference to the diagram. It is shown that, in the triangle, the parts representing actual industrial application are very limited, namely, exothermically to the trapezium YXX'Y' (Fig. 3) and endothermically to the segment KL.

Equilibrium Conditions

To the three independent reactions defining the system when no carbon is formed should correspond three static conditions; or rather two, since one of them—oxygen taking part—in equilibrium with the others is very small under the usual temperatures (A. Lotteri, "Incomplete catalytic oxidation by free oxygen," *La Chim. e Ind.*, 141, *23*, 126-9, 175).

In order that, in the absence of carbon,



Industrial applications

Fig. 3

the gaseous phase may be in equilibrium at a given temperature and pressure P (k and k′ being equilibrium constants at this temperature) it is sufficient that :

1. Concentrations of hydrogen, water vapour, CO and CO_2 satisfy the equation

$$\frac{(CO) \times (CH_2O)}{(CO_2) \times (CH_2)} = k \quad \ldots\ldots\ldots \quad (I)$$

2. The concentration of residual methane satisfies

$$\frac{(CH_4) \times (H_2O)}{(CO) \times (H_2)^3} = k' \times P^2 \quad \ldots \quad (II)$$

If carbon is formed, a supplementary independent reaction is needed. The system can no longer be shown on a plane surface, but it is possible nevertheless to indicate on the diagram the limits of carbon formation.

As supplementary reaction the Boudouard reaction (9) must be chosen rather than (8), *i.e.*, without methane. For the gaseous phase to be in equilibrium with solid carbon concentrations must satisfy, in addition to (I) and (II), also $\frac{(CO)_2}{(CO_2)} = \frac{1}{P} \times k''$ (III).

Values of k, k′, and k″ at different temperatures are as follows :—

Temp. °C.	k	k′	k″
600	0.39	1.93	0.095
650	0.51	0.36	0.34
700	0.65	0.79	1.08
750	0.80	0.021	3
800	0.96	0.0061	7.6
850	1.14	0.0019	18
900	1.33	6.9×10^{-4}	38
950	1.52	2.7×10^{-4}	78
1000	1.73	1.1×10^{-4}	153

Applying the foregoing to the case of incomplete combustion of methane with oxygen (a representing the numbers of mols. of methane unreacted), starting with *m* mol. oxygen and 1 − *a* mol. methane, and with *p* negative or zero, we have

$2 - 2m - p$	mol. CO
$2m + p - 1$	,, CO_2
$2 + p$	,, H_2
$-p$	,, H_2O
a	,, CH_4
or $3 + a$	,, total

Concentrations in the gaseous phase are not arbitrary but governed by stoechiometric relations

$$\frac{(CO) + (CO_2)}{(H_2) - (H_2O)} = \frac{1}{2}$$

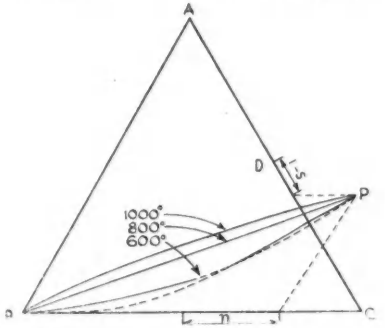
Diagrams are given showing the isotherms of equilibrium, from which it is shown that at given temperatures and pressures equilibrium concentrations are wholly defined by the oxygen ratios used when the methane value (*a*) is low; otherwise a correction is needed. The critical point for oxygen corresponding with carbon is found to be 0.73 / 1.13 = 0.65. The effect of temperature for a given oxygen rate is discussed; also effect of pressure and the case where air is used for the reactions.

Conversion by Oxygen in the Presence of Water Vapour and Carbon Dioxide

In starting with *m* mol. oxygen, *n* mol. water vapour, *s* mol. CO_2, and 1 + *a* mol. methane, the following are obtained after reaction :

$2 - 2m - p$	mol. CO
$s + 2m + p - 1$	,, CO_2
$2 + p$	,, H_2
$n - p$	,, H_2O
a	,, CH_4
$= n + s + a + 3$	total.

Determination of static conditions and dis-



Equilibrium isotherms. Broken line is equilibrium with carbon

Fig.4

(*Continued at foot of next page*)

The B.T.H. Research Laboratory

Wide Range of Scientific and Industrial Advances

REFLECTING the extension of basic knowledge in many scientific fields which is being brought about by commercial research generally is the brief account, just published, of a cross-section of the activities during 1948 of the research laboratory at Rugby of the British Thomson-Houston Co., Ltd. These included, in connection with glass research, the development of new glasses for special applications.

One of the results of the investigations in this field—records the B.T.H. Report—was that a phosphate glass which absorbs strongly in the visible region, but transmits very efficiently the 2537Å resonance radiation of mercury, has found application in special scientific instruments, for example, the photoelectric spectrometer for measuring atmospheric ozone (developed by Prof. G. M. B. Dobson) and in U.V. microscopy.

Other glasses developed, based principally on calcium aluminate and containing only a small percentage of silica, have the property of transmitting infra-red radiation of wave length approximately 5μ, which is almost completely absorbed by silicate glasses, and even by fused silica. A potassium-barium silicate glass completely free from sodium has been produced at the request of the Clarendon Laboratory, Oxford, for the distillation of pure potassium.

In the field of electrons, a device consisting of two roller electrodes and recording mechanism has been developed for the detection of pinholes in plastic and other insulating materials.

The halogen vapour leak detector (the result of work by C. W. Rice and W. C. White, of the American G.E. Company—(THE CHEMICAL AGE, *59*, 695) has been studied in the B.T.H. research laboratory. There are many important applications involving the detection of leaks, for which this device is applicable.

The investigation of diffraction microscopy was prompted by the desire to improve the resolving power of electron microscopes. After some 15 years of rapid development, progress in electron microscopy has come to a stop, and only a fundamentally new idea can enable electron microscopes to resolve details significantly finer than those achieved at present, which are of the order of 10 Angstroms, or about one millionth of a millimeter. Although this is a remarkable achievement, the most important details of matter, the atoms and their arrangement, are still around the corner, the B.T.H. research report states.

Diffraction miscroscopy is based on a new optical principle of image formation. In a first step, a diffraction diagram is produced which has little or no likeness to the object; and in the next step, the likeness is restored by a second diffraction process. This roundabout way is necessary in electron microscopy where the direct method—simple image formation by lenses—is barred by the imperfection of electron lenses.

Electron Microscopy

It is intended to apply this method to electron microscopy by taking the hologram with electrons, but reconstructing it by means of visible light. Electrons have wavelengths about 100,000 times smaller than light, but they are diffracted by very small objects in much the same way as light. Thus, the new electron diffraction microscope will be a two-piece apparatus, consisting of an electronic and optical part.

It is hoped that details down to one ten millionth of a millimeter may be resolvable by this new method, which may for the first time produce direct pictures of the atoms of matter.

OXIDATION REACTIONS OF METHANE

(*Continued from previous page*)

cussion of results are the same as before. The equilibrium isotherms and the limiting curve have a common ending in B (Fig. 4), but their second point of intersection instead of G is at the point P, the position of which is determined by the co-ordinate values

$$p = n, \; u = 1 - s.$$

Tables are given for carbon formation thresholds and for equilibria at various temperatures under atmospheric pressure. The theoretical threshold (carbon formation) is detemined graphically for different values of n and s, m remaining equal to 0.70. This threshold is lowered by addition of water vapour and to a less degree by addition of carbon dioxide. The significance of this carbon formation and of its possible avoidance in the light of practical experience is briefly considered. Further experimental data are desirable.

In conclusion the author discusses endothermic reactions, and conversion of gas of low methane content or containing other hydrocarbons.

DEPRECIATION & MAINTENANCE—VII

Taxation and the Maintenance of Industrial Capital

by S. HOWARD WITHFY, F.Comm.A.

SUBJECT to compliance with the provisions of the Companies Act, the form in which accounts are presented to stock and shareholders is largely within the discretion of company directors, and provision for depreciation and amortisation should be made on uniform bases each year, according to the estimated exhaustion of the capital value of the particular assets

Sums set aside out of profits to cover obsolescence or for an increase in the possible cost of replacement are in the nature of reserves and cannot always be estimated with any degree of accuracy, but depreciation in the value of buildings, machinery, plant, tools and equipment, and other assets that diminish in value by reason of their employment in the business, and amortisation of leaseholds, patents and any assets that become exhausted by the effluxion of time should be computed and recorded in accordance with a fixed scale so that the actual position can be readily appreciated.

Apportioning Depreciation

Such assets as jigs and patterns, including loose tools the service life of which is relatively short, may be subjected to periodical revalution, the amount by which the existing book value exceeds the new valuation figure being credited to the asset account and charged against the current year's profits, but unless other considerations are involved the amount shown on the balance sheet should not exceed actual cost.

Although one of the chief essentials is that the periodical profit and loss account should be debited with an adequate amount to cover depreciation in the capital value of all the wasting assets employed for profit earning purposes, this should be done in an equitable manner as between one year or period and another, and the amount of such depreciation should be deducted from the specific assets when drawing up the balance sheet. Provision for depreciation in the value of freehold buildings, for example, is usually computed by deducting an equal proportion of the original cost each year.

When it is difficult or impossible to determine the current value of a group of assets, by calculating a percentage of the original cost, a revaluation on the part of an experienced and unbiased valuer may be the only satisfactory way of adjusting the book records.

Revaluation of Assets

Apart from the fact that auditors need not report on the value of the assets as shown on the balance sheet, or in regard to the adequacy or otherwise of the amount charged against profits under the heading of depreciation, a revaluation of certain assets at certain periods carries a number of advantages. Additional capital issues, whether in the form of shares, stock, or debentures can be materially facilitated by the publication of a certificate of value above the name of an acknowledged expert, and such a certificate may be regarded by a bank as sufficient guarantee for an extension of credit facilities.

Insurance claims and appeals against excessive or arbitrary assessments are also likely to be more successful if the assets have been independently valued, and the determination of balance sheet values by the revaluation method is usually satisfactory alike from the standpoint of the owner, directors and the shareholders.

Having regard to the steep rise in the cost of replacements, a revaluation of assets at the present time might show an actual appreciation in relation to the balance standing in the books. In a recent case, for instance, certain loose plant and tools having a book value of £300 were revalued by a chemical trade expert at £420 on the basis of their lowest prevailing market prices, and an adjustment was made by writing up the book value of the assets and transferring the appreciation to a reserve account, thus :

Loose Plant and Tools

Debit			*Credit*		
1948		£	1949		£
Dec. 31.	To balance brought down	300	Jan. 28.	By balance carried down as per revaluation	420
1949					
Jan. 28.	To transfer to reserve ...	120			
		£420			£420
Jan. 28.	To balance brought down	£420			

(*Continued overleaf*)

Owing to the uncertainty in regard to the index of capital goods in the future it is inadvisable to write up the book value of all assets in this way, although the change in the purchasing power of money is a factor to be taken into consideration when deciding the amount to be reserved for re-equipment.

Plant Omitted

Details of all fixed assets should be recorded in the user's books in such a way as to show the cost of each unit or group, the amounts written off from time to time, and the basis of the provisions made. Some chemical firms are able to rely entirely on the accuracy of their registers and inventory records, but an actual count of certain loose tools may be necessary. Care is required to ensure that none of the following is included in the stock:—

(1) Any small units of plant such as pumps for handling corrosive liquids, sieves, screens, recorders, indicators, laboratory furniture and fittings, etc., the value of which is shown in separate ledger accounts. To include in the stock figure any assets which are already recorded as debit balances would have the effect of inflating both the credit side of the periodical trading or manufacturing account and the assets side of the balance sheet.

(2) Any storage tanks, mixers, stirrers, or jacketed pans, etc., the cost prices of which have already been treated in the books as capital outlay.

(3) Any units of equipment, materials or stores which have been received on the premises or at a site on approval, or for sale on a commission basis, or otherwise and which have not been included in the purchases for the period under review.

(4) Any units of plant or goods which have been sold and recorded in the sales journal or day book, but which have not yet been actually delivered or taken away. The same items cannot be treated as sales and as forming part of the stock without causing an inflation of the profit balance.

Although depreciation in the value of chemical engineering and industrial machinery and plant should be incorporated in production costs in order to ensure a satisfactory margin of profit on individual contracts, such debts are not allowed to stand as deductions for purposes of income tax, in determining the taxpayer's liability under Schedule "D" a scale of wear and tear allowance is applied to ensure that deductions are made only in respect of those parts of the taxpayer's equipment which have actually been worn out in the process of earning profits to be taxed.

As such allowances must necessarily be inadequate during a period of rising replacement costs, users of chemical plant should make themselves thoroughly acquainted with the various allowances made by the Inland Revenue, and should make up a special profit and loss account each year to arrive at the balance of taxable profit.

Amounts charged against profits to cover decline in value of business goodwill should be added back to the figure of profit shown in the ordinary profit and loss account, and the same applies to charges made for depreciation of plant, machinery, tools, equipment, freehold premises, leaseholds and any other assets that diminish in value by time of their employment in the business.

Appropriation Account

The profit realised by the proprietor of a chemical manufacturing or engineering business, also the profit of the private partnership, is usually merged in the capital account, but the profits and capital of the limited liability company must be shown separately. Capital cannot be altered unless definite statutory requirements are fulfilled.

Only the profit realised or the loss sustained during the period under review should be shown in a company's profit and loss account, the balance brought forward from the previous period and all appropriations being shown in a special account drawn up on the following lines:—

Profit and Loss Appropriation Account

Debit	£	*Credit*	£
To 7 per cent dividend on £500,000 cumulative preference shares, *less* income tax	17,500	By Balance brought forward ...	28,719
To 7 per cent dividend on £300,000 ordinary shares, *less* tax	10,500	By net profit, transferred from profit and loss account	98,815
To staff bonus	5,000		
To provision for deferred repairs	10,000		
To reserve for depreciation ...	30,000		
To transfer to general reserve ...	25,000		
To balance carried forward	29,534		
	£127,534		£127,534

While all normal expenses and business charges are allowed to stand as debits in the account, expenses of a personal nature or which are not directly connected with the taxpayer's ordinary business will be disallowed. Items representing ground rents, annual interest payments, annuities and payments of a similar nature, from which income tax at the standard rate should have been deducted at the time of payment, should be added back for assessment purposes, and, of course, the cost of structural alterations, additions, extensions or improvements to buildings should be regarded as a capital charge.

The private drawings of the proprietor, or the salaries paid to partners, will not be allowed to stand as charges against the trading, and this applies to interest on capital and to payments made to inactive partners, and in cases where the proprietor resides on the business premises only the statutory allowances for rent, rates and lighting will be granted.

Maintenance of Fixed Assets

Returns recently submitted by the directors of companies specialising in the manufacture of chemicals and chemical plant show that after meeting the dividends on the preference capital the balances available to the holders of equity stocks averaged about 25 per cent. Of this, only 10 per cent was actually distributed in the form of dividends on the ordinary capital, including participating preference capital ranking equally with the ordinary as to rate of further dividend.

The balance of 15 per cent was transferred to various reserves or added to forward balances. Such percentages, however, are very misleading in that many of the accounts and financial statements fail to present the real picture in physical as distinct from monetary terms.

The percentages quoted above are not only gross figures subject to income tax at the rate of 9s. in the £; they are calculated on the basis of equity capital which has become highly geared and artificially deflated. Much of the productive equipment now in use is capable of withstanding high pressure and maximum operation in the attainment of targets and in many instances it has been found possible to scrap the less reliable units and sections of plant.

The general position in the chemical industry is that it takes at least twice the amount of capital to finance the same quantity of work as before the war.

When prices are steady, users of machinery and plant and other fixed assets are able to make provision on a generous scale for the inevitable decline in the real value of the productive equipment due to wear and tear or obsolescence. This need for creating and building up reserves was and still is common to all commercial and industrial concerns, but owing to the increase in the cost of capital goods the allocation of sums sufficient to cover depreciation has become much more difficult, often quite impossible.

That the ratios of earnings and distributions would more truly reflect the actual results of the year's operation can be demonstrated by an analysis of the audited accounts of a cross section of companies engaged in the manufacture of chemicals and chemical plant.

Ten of these companies, for example, with a total issued capital of £88,012,552 realised net profits aggregating £8,928,627 during the last accounting period. The dividends on the preference capital averaged rather more than 7 per cent and amounted to £1,314,826, leaving a balance of £7,613,801 available to the holders of the equity capital.

Details relating to the individual companies are tabled below, showing the figures under the main headings :—

ACCOUNTS OF MANUFACTURERS OF CHEMICALS AND CHEMICAL PLANT

	Issued Capital	Brought Forward	Net Profit	Dividends Distributed	Reserve Allocations, etc.	Carried Forward	Div.
	£	£	£	£	£	£	Percent
ANCHOR CHEMICAL	142,500	16,664	60,755	17,325	20,862	39,232	—
6 p.c. Pref.	75,000	—	—	2,475	—	—	6
Ordinary	67,500	—	—	14,850	—	—	40
BRITISH CELANESE ...	9,961,333	479,252	858,376	430,169	350,000	557,459	—
7 p.c. 1st Pref. ...	3,500,000	—	}	332,870	—	—	7
7½ p.c. 2nd Pref. ...	4,250,000	—	}		—	—	8.88
Ordinary	2,211,333	—	—	97,299	—	—	8
BRITISH GLUES AND CHEMICALS	700,000	34,643	113,606	52,937	53,500	41,812	—
8 p.c. Partg. Pref. ...	525,000	—	—	28,875	—	—	10
Ordinary	175,000	—	—	24,062	—	—	25
BROTHERHOOD (PETER) ...	340,000	150,685	*105,662	24,241	72,364	159,742	—
5½ p.c. Pref.	165,000	—	—	4,991	—	—	5½
Ordinary	175,000	—	—	19,250	—	—	20
BURT, BOULTON AND HAYWOOD	669,790	20,370	†73,132	19,805	42,500	31,197	—
7 p.c. Pref.	150,000	—	—	4,331	—	—	†7
Ordinary	519,790	—	—	15,474	—	—	3½

				Loss‡				
DUFAY-CHROMEX	998,622	9,523	3,583	5,940	—	—	—	—
6 p.c. Pref.	180,000	—	—	5,940	—	—	—	6
6 p.c. 2nd Pref. ...	100,000	—	—	—	—	—	—	Nil
Ordinary	718,622	—	—	—	—	—	—	Nil
GREEFF CHEMICALS HOLDINGS	§250,000	15,774	30,257	28,750	—	—	17,281	—
5½ p.c. Pref.	125,000	—	—	6,875	—	—	—	5½ (gross)
Ordinary	125,000	—	—	21,875	—	—	—	17½ (gross)
IMPERIAL CHEMICAL INDUSTRIES	74,542,807	3,305,815	7,646,933	3,702,573	4,000,000	3,250,175	—	—
7 p.c. Pref.	24,077,691	—	—	926,902	—	—	—	7
Ordinary	50,465,116	—	—	2,775,581	—	—	—	10
LAWES CHEMICAL COMPANY	265,000	4,305	19,605	8,956	11,500	3,454	—	—
7 p.c. Pref.	38,375	—	—	1,477	—	—	—	7
Ordinary	226,625	—	—	7,479	—	—	—	6
UNITED INDIGO AND CHEMICAL CO.	142,500	22,149	‖23,884	9,797	13,781	22,455	—	—
5 p.c. Partg. Pref. ...	90,000	—	—	6,187	—	—	—	12½
Ordinary	52,500	—	—	3,610	—	—	—	12½

* Including £30,145 provisions and other credits no longer required. † For 9 months. ‡ After transferring £10,639 from reserve. § Capital increased since date of accounts. ‖ Including £4,090 recovered from previous tax provisions

The combined net profits of the above companies equalled 10.1 per cent of the total capital ranking for dividends, and after adding the balances brought in from previous accounts the disposable balances represented 14.7 per cent of capital. The dividends paid to holders of the preference capital amounted to £1,314,826 and the dividends on the ordinary and participating absorbed £2,985,667, making a total of £4,300,493, which equals 4.9 per cent of the total issued capital. After allocating £4,564,507 to various reserves, etc., representing 5.1 per cent of the capital, the forward balances were slightly higher than a year ago :—

TOTAL ISSUED CAPITAL OF 10 COMPANIES, £88,012,552, viz. :—
£33,186,066 Preference ; and
£54,826,486 Ordinary (including participating preference ranking equally with ordinary as to rate of further dividend.)

	£	Percentage of Issued Capital
Brought forward from previous accounts	4,059,180	4.6
Net profits as per last accounts	8,928,627	10.1
Disposable balances ...	£12,987,807	14.7%
Dividends distributed	4,300,493	4.9
Allocated to reserves, etc. ...	4,564,507	5.1
Carried forward to next accounts	4,122,807	4.7
	£12,987,807	14.7%

The net profits were distributed thus :—

DISTRIBUTION OF NET PROFITS

	£	Gross
Combined net profits of 10 companies	8,928,627	
Dividends of preference capital	1,314,826	
Available to holders of equity capital	£7,613,801	25.2%
Dividends on ordinary and participating	2,985,667	10.0%
Undivided	4,628,134	15.2%
	£7,613,801	25.2%

Thus, whereas present accounting methods show equity earnings to be 25.2 per cent of capital, of which 10 per cent has been distributed and 15.2 per cent ploughed back, the writing up of fixed assets and a capitalisation of reserves resulting in a doubling of capital values would show the earnings to be 6.9 per cent, of which 2.7 per cent is distributed and 4.2 per cent ploughed back, after allowing for standard income tax.

The replacement of machinery and plant is, of course, directly connected with the rise in the cost of capital equipment and if the wear and tear allowances were made applicable to the new values the ratios of earnings and distributions in the chemical industry would more accurately reflect the actual state of affairs.

(To be continued)

MORE CHEMICAL WORKERS

EMPLOYMENT in the chemical and allied trades in November, 1948, details of which have been published in the current *Ministry of Labour Gazette*, again showed a satisfactory increase over the periods compared in every section covered with the exception of explosives, which continued to show the post-war decline in employment. The sectional distribution of labour was as follows :—

Industry	(Thousands) Mid-1939	Mid-1947	Nov., 1948
Coke ovens and by-products works	12.4	13.7	14.5
Chemicals	124.8	187.9	196.8
Explosives	37.1	34.6	34.0
Paint, varnish, etc.	26.9	30.9	32.1
Oil, glue, soap, ink, etc. ...	83.2	81.6	87.8
Total chemicals, etc. ...	284.4	347.8	365.2

GERMANY'S GROWING OIL OUTPUT

Back to Pre-War Level : Large Reserves

SINCE the end of the war, Germany has made strenuous efforts to increase her crude oil output. These efforts have, in fact, been rewarded with good results, for the output of crude oil last year reached the pre-war level. Exploitation of new fields and modernisation of pumping installations, formerly much handicapped by lack of equipment and labour, have made remarkable progress since the currency reform in the middle of 1948. Exploratory work and test drilling have also been intensified.

It is well-known that the Hanover region, the Emsland and Schleswig-Holstein are the most important of the known oil-bearing areas of Germany. It is worthy of note that the most significant progress was achieved in the Emsland (bordering the Netherlands) in the course of last year. Compared with 1947, output here of crude oil rose by no less than 60 per cent. The bulk of the Emsland output is derived from Emlichheim (64,850 tons, against 52,000 tons in 1947) and Georgendorf (53,300 tons against 24,100 tons). Exploitation is in the hands of such well-known concerns as the Wintershall, A.G., the Preussag, the Gerwerkschaft Elwerath, and Deilmann of Dortmund. In the Hanover region, the main producer is near Nienhagen, but output here is stated to have declined against 1947 by about 10,000 tons down to 91,700 tons.

A Year's Increases

The development of Germany's crude oil during 1947-48 is illustrated by the following table (in metric tons) :—

	1947	1948
Hanover	364,000	530,000
Emsland	114,000	168,000
Schleswig-Holstein ...	93,000	92,000
Baden	6,000	5,000
Total	577,000	795,000

The Gewerkschaft Elwerath controls at present about one-quarter of Germany's growing crude oil output, followed by the Wintershall, A.G., with about 19 per cent, the German Oil A.G. with 18 per cent, and the German Vacuum Oil A.G. with 11 per cent. The Gewerkschaft Brigitta, owned jointly by the Shell group and the Standard Oil Co., controls roughly 10 per cent, and about 8.5 per cent is the share of the Preussag.

Concurrently with the increase in crude oil output, there has been an increase both in the capacity and output of German oil refineries, and it is reported that plants in the British zone, alone had an output of 700,000 tons in 1948. German as well as foreign crude oils were treated, imports coming chiefly from the U.S.A., Venezuela, and to a lesser degree from Saudi-Arabia. For the current year, crude imports of 2.5 million tons are envisaged, a large part of which is to be refined in the Hamburg area, where the capacity of reconstructed plants now aggregates some 500,000 tons per annum. The hydrogenation works at Wesseling and Gelsengirchen have meantime also resumed operations and are stated to be in a position to treat 700,000 tons per annum.

Proved Reserves

It is considered probable that Germany's oil industry will be developed further within the next few years, and it is interesting to note that proved oil reserves are estimated at about 12 million to 15 million tons, of which 10 million tons are in the Emsland. The German authorities, undoubtedly with the support of the Allied authorities, aim at a steadily growing oil output in order both to save dollars spent at present on foreign oil supplies and to utilise exchange thus freed for the import of food and raw materials.

FRENCH MINERALS

THE search for wolfram seams is being intensified in France and promising signs have been noted in the Creuse. Wolfram has already been found in the granitic Limousine mountains, notably at Ambazac, but serious mining has not been undertaken. It is possible that the bituminous seams exploited at Boubron-Saint-Hilaire will be closed down. For some months extraction has produced 600 tons of slag daily, the full capacity of the existing carbonisation apparatus.

The discovery of mica in the French Union is of considerable importance to France, which has scarcely any. She has one seam in the Alpes-Maritime where the high altitude, 1600 metres, is an obstacle to exploitation. During the war, a seam in the Creuse was exploited, but produced mediocre results. On the other hand, certain Moroccan seams are apparently of interest. Already a plant has been installed at Casablanca to treat white regional micas, which contain : 47.31 per cent silica; 33.18 per cent alumina and iron; 11.05 per cent lime; traces of magnesium; 6.65 per cent potassium. There is a 1.75 per cent loss in manufacture.

Home News Items

Israeli Coinage.—Coins bearing designs similar to those employed under the Maccabean dynasty 140 BC are being manufactured by the metals division of I.C.I., Ltd., for the Government of Israel.

Long Service.—Statistics just produced show there is one employee at the Port Sunlight soap factory of Lever Bros., who has given 52 years' service to the firm; three with 51 years; nine with 49 years, six with 48 years; over 1530 have served 25 years or more.

Hydrocarbons from Acetylene.—The description, from the U.S.A., of the German method formerly employed at the I. G. Farben plant at Rheinfelden for the production of chlorinated hydrocarbons from acetylene, recently referred to (THE CHEMICAL AGE *60*, 115) was the subject of an earlier TIDU publication—FIAT Final Report 843 (6s. 6d.).

Coal Production Up Again.—The total output of coal in Britain last week again showed a slight increase over the previous week and over the corresponding week last year. Comparative figures are: Last week: 4,303,800 tons (deep-mined 4,094,700 tons, open-cast 209,100 tons). Previous week: 4,303,200 tons (deep-mined 4,082,100 tons, open-cast 221,100 tons). Corresponding week last year: 4,147,800 tons (deep-mined 3,968,700 tons, open-cast 179,100 tons).

Dollars for British Plant.—A contract for $300,000 (£75,000) has been signed with the Minneapolis-Honeywell Regulator Company, Minneapolis, as a part of the investment guarantee programme of E.C.A. to encourage American investment projects to aid European recovery. The company is to invest this sum in its wholly owned subsidiary, Honeywell Brown, Ltd., which has leased a plant at Blantyre, Glasgow, for the manufacture of parts required in the main company's indicating, recording, and controlling instruments.

New Fuel Oil Price Cut.—Further reductions in the price of fuel oil were announced this week to inland buyers. Shell Mex and B.P. reduced the price of B.I'. Britoleum, Shell and B.P. heavy fuel oils by ½d. per gallon (approximately 10s. per ton). A similar cut in price was announced by the Anglo-American Oil Co. for Esso fuel oil, heavy and medium grades, and this company also announced a reduction in the price of bunker fuel prices. Fina Petroleum Products reduced the price of its light and heavy furnace oils by ½d. per gallon.

Fire Damage.—A hundred 14 lb. tins of activated carbon were damaged in a fire at a storeroom in the railways goods yard at Holme Street, Derby Road, Liverpool, last week. Firemen were engaged for nearly an hour before the blaze was put out.

Clay Processing Plant.—To meet growing demand, the British "Rema" Manufacturing Co., Ltd., subsidiary of Edgar Allen & Co., Ltd., have placed on the market a self-contained plant which processes lump wet clays in such a manner as to give a dry finely powdered product.

£32,000 Steel Extension.—The Motherwell and Wisham local authorities have approved the plans of the Lanarkshire Steel Co., Ltd., for the erection of buildings in Craigneuk Street for a power station and cooling tower in connection with the Lanarkshire Steel Works, Motherwell. The estimated cost is £32,000.

Grangemouth Housing Problem.—Expansion of the chemical and oil industries at Grangemouth will necessitate considerable expansion of housing and other facilities. Out of the 3000 houses planned in the next five years, 1000 are to be allocated key workers in these industries. Although the programme is to be given priority it is feared shortage of houses will not be eliminated quickly.

Carbon Black Plant.—Despite early fears that high costs might affect the project, the contract for building a carbon black plant at Ellesmere Port, Cheshire, has been placed by Godfrey L. Cabot, Inc., of Massachusetts, with Simon-Carves, Ltd., Stockport. The factory is expected to be in full production within two years, and will produce 100,000 tons a year of carbon black from oil imported from America.

New Furnaces.—Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees, record having secured two important blast furnace contracts. The first is for the Polish Government, and is for equipment for a furnace designed by the company's American associates, The Freyn Engineering Co. The second contract is for the re-building of the No. 1 furnace of the Cargo Fleet Iron Co., Ltd. This will be the second furnace at this plant to be modernised, and the work forms part of the general plan for the extension of the British steel industry. Between 1929 and 1948 Ashmore, Benson, Pease & Co., Ltd., completed 13 blast furnaces at home, five in Africa, and two in Turkey.

Technical Publications

THE use of electrodes for quantitative electrochemical analysis is considered to have been introduced in 1864, by Wolcott Gibbs, when he used a platinum crucible as a cathode with a platinum wire for an anode in the determination of nickel and copper. In its latest booklet "Platinum Electrodes," Johnson, Matthey & Co., Ltd., traces the history, development and modern uses of such electrodes. A useful guide is given for the selection of electrode types, divided into stationary electrodes in stirred electrolytes, rotating electrodes, and electrodes for unstirred electrolytes. There is a section devoted to the application of electrochemical methods of analysis to microchemistry and notes on the care and maintenance and repair service of platinum electrodes.

* * *

The aims of the Foseco Foundry Services, Ltd., Birmingham, are primarily to provide high quality products, but they have also established a valuable service of technical advice and laboratory assistance. Some examples of the problems with which this service deals are set out in some detail in "Foundry Practice" (No. 94) just issued comprising articles on gravity die castings; iron founding (chemical composition and mechanical tests); design of heavy moulding boxes from built-up sections, and under the section "Technical Service Department Goes to Press" an investigation on a shrinkage phenomenon in phosphor bronze.

* * *

The first number of the *Journal of the Institution of Works Managers* has been published for private circulation. It contains interesting articles on various phases of works management and efficiency, as well as a biographical sketch of the Institute's president, Lord Braintree, J.P., who is chairman and managing director of the Crittall Manufacturing Co., Ltd. The second number (February, 1949), contains a message to members from Sir Steven Bilsland, one of the vice-presidents, and abstracts from Sir Charles J. Bartlett's paper on "The Broad Responsibilities of Works Managers," given at the Leamington Conference last October.

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The many activities of Bamag, Ltd., in different parts of the globe are discussed and illustrated in the winter issue of *Bamagazine*. Articles vary from an account of a safari in South Africa, to the tale of a Spanish order for a fat-splitting plant.

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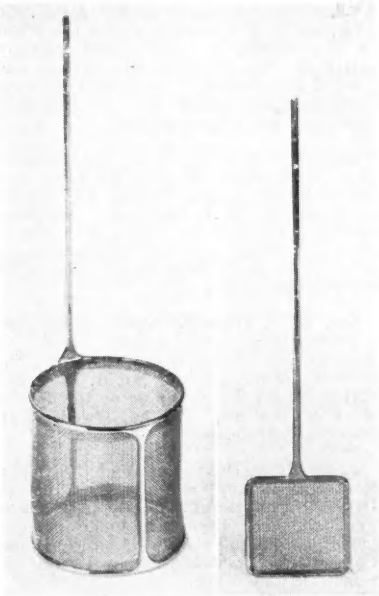

Platinum electrodes by Johnson, Matthey & Co., Ltd., cathode type 72020 and (right) paddle-shaped type 72073 rotating anode

Believed to be the only book of its type available, "Aluminium Alloys, U.S. Standard Specifications," a new and handy compilation of the principal American aluminium industry specifications has been published (free) by Federated Metals, a division of the American Smelting and Refining Company, 120 Broadway, New York. The 24-pp. reference book contains the latest departmental specifications pertaining to aluminium sand castings, permanent mould castings, die castings, wrought alloys and ingots.

* * *

A "New Directory of Italian Chemical Production" (Nuovo Repertorio della Produzione Chimica Italiana) has now been published and is available from *Techindus*. Edited by Dr. Maria Ragno, it contains the latest information on the Italian chemical industry and lists (with an English translation) of products, manufacturers and exporters.

Personal

MR. G. A. DUMMETT has been appointed scientific manager of the A.P.V. Co., Ltd., and will be responsible for the scientific and development side of the company's activities. Mr. Dummett was formerly manager of the company's chemical engineering department to which Mr. R. Edgeworth Johnstone has been appointed.

DR. H. NORTH, of I.C.I., Ltd., ammonia plant at Mossend, Glasgow, has returned to Scotland after a three-months' business trip to Japan on I.C.I. business. He leaves shortly to take up new duties at Prudhoe in Northumberland and will be succeeded at Mossend by MR. JAMES BLACK, who is now his assistant there.

MR. E. J. HOLFORD STREVENS has been appointed Regional Controller, North Midland Region of the Board of Trade, Nottingham, in the place of Mr. J. I. Piggott, C.B.E., M.C., who is taking up the appointment of chairman of the Jewellery and Silverware Development Council.

PROF. K. S. DODDS, head of the Department of Botany and Genetics at the Imperial College of Tropical Agriculture, Trinidad, has been appointed principal scientific officer of the Empire Potato Collection, Commonwealth Bureau of Genetics, Cambridge.

MR. G. A. S. NAIRN, chairman of Lever Brothers (Port Sunlight), Ltd., has been elected chairman of the North-West Regional Council of the Federation of British Industries. He has been deputy-chairman of the council for two years.

MR. HAROLD ELEY, general advertising manager of the Dunlop Rubber Company, retires next month after 36 years' service. He was one of the founders, and first chairman, of the Incorporated Advertising Managers' Association.

PROF. F. F. NORD, Department of Organic Chemistry, Fordham University, New York, has been awarded the Carl Neuberg Medal of the American Society of European Chemists and Pharmacists, 1949.

PROF. G. W. ROBINSON, Professor of Agricultural Chemistry at the University College of North Wales, has been appointed an honorary member of the Spanish Higher Council for Scientific Research.

SIR HENRY DALE and PROF. J. HEYMAN, of Stockholm, have been elected honorary Fellows of the Royal College of Obstetricians and Gynæcologists.

Few for Canadian Research

THE great majority of chemists and chemical engineers graduating from Canadian universities in the next three years—approximately 2400—would take jobs in industry or teaching rather than in research fields. According to Mr. T. W. Smith, of Montreal, president of the Chemical Institute of Canada. Only about 10 per cent of the employment opportunities available will be in research or laboratories, he told a dinner meeting of the institute.

This was the reverse of the situation in the U.S.A., where the majority of such graduates took up research work, he said. Many felt the trend in Canada was an undesirable one. Chemistry had made excellent progress in Canada but in the main it had been geared to the nation's domestic needs and resources, Mr. Smith said. The rate at which the chemical industry was employing chemists and chemical engineers actually exceeded not only the rate of growth of the industry but of all industry. Many graduates, consequently, found themselves in administrative, development, production, sales and equivalent jobs rather than in the laboratory. That might have frustrated the research-minded.

Mr. Smith said there would be no difficulty in assimilating the next three years' graduates into industry, teaching and other fields than laboratory work. Many of them would be ex-Servicemen and their problem would be to adapt themselves to a variety of occupations in which their primary requirements would not be a knowledge of chemistry but in which their chemical training would stand them in good stead.

Obituary

The death was announced on February 13 of PROFESSOR THOMAS STEWART PATTERSON, aged 77. He was Gardiner Professor of Organic Chemistry, Glasgow University from 1919-42. He studied chemistry at Anderson College, Glasgow, graduated Ph.D. at Heidelberg University in 1895, and became D.Sc. of Glasgow and London universities. His 38 years' association with Glasgow University began in 1904 when he was appointed lecturer.

MR. ALFRED DIGGORY, a director of Diggory and Co., Ltd., tar distillers, of Liverpool, died at his home in Old Kingsley Road, Boughton Heath, Chester, on February 10, aged 55.

New Head of DSIR

Sir Ben Lockspeiser Leaves Ministry of Supply

Sir Ben Lockspeiser

THE King has approved the appointment of Sir Ben Lockspeiser as secretary of the Council for Scientific and Industrial Research in succession to Sir Edward Appleton, who takes up his post as principal of Edinburgh University at the end of April.

Sir Ben Lockspeiser is a Londoner and was educated at the Grocers' School, North London, and Cambridge, where he took an M.A. in natural science and engineering. During the first world war he served in the Army, and was invalided home from the campaign in Gallipoli in 1915. He was then employed as chemist and research assistant at the Admiralty Steel Laboratory, Sheffield, and subsequently at the Inventions Department of the Ministry of Munitions.

Aeronautical research and development have been the principal problems with which Sir Ben has been concerned. In November, 1920, he joined the Royal Aircraft Establistment, Farnborough, as technical assistant, dealing with research into plastic flow of metals and problems of flutter and deicing of aircraft, and was appointed head of the Air Defence department in 1937.

Four months before the outbreak of the second world war he was transferred to the Ministry of Aircraft Production as assistant director of scientific research, becoming deputy director in 1941, and director in 1943, which position he retained until his appointment as director-general of Scientific Research (Air) at the Ministry of Supply, 1945. He took on the newly created post of chief scientist to the Supply Ministry in the following year.

Sir Ben Lockspeiser is 57, and was knighted in 1946. He is a member of the Institute of Mechanical Engineers, Fellow (and council member) of the Royal Aeronautical Society and executive officer of the Aeronautical Research Council. He was a member of the British delegations of the Commonwealth conference on defence science and the Commonwealth conference on aeronautical research, and last year visited Australia and New Zealand for discussions on developing rocket research.

Functions of University and Industrial Research

THE universities demanded complete liberty of action as regards the control and direction of their research, it was pointed out in a paper on "Industrial Research Organisations," by Mr. G. Wilson, which was read before the Manchester branch of the BAC. Such freedom was necessary if the really original minds were to have the right environments in which to develop their full powers.

But the universities, nevertheless, could not be harnessed to the solution of particular industrial problems, because it was not their function to combine as a team and move together in one specified direction. Industry, therefore, must build up its own research teams—bodies of men of the same calibre as the best of the university men—applying the same techniques in precisely the same way.

The primary function of such teams, industrial research organisations, was to provide the new knowledge which industry required for the solution of its problems. The fact that this was the primary function of a research organisation did not, of course, mean that research organisations should not apply existing knowledge to the solution of technological problems.

That must, of course, be another of their functions, though for this purpose they were not nearly so well placed as the research organisations of individual firms, because there was no such thing as an absolute solution of an industrial problem.

Mr. Wilson regarded the universities as the home of the new technique and the source of our most expert scientific advice; the research associations as the bodies charged with the duty of providing industry with the new knowledge it required if progress was to be maintained; and the research organisations of individual firms as the bodies most suitably placed for applying that new knowledge to the solution of the particular problems of their own firms.

Overseas News Items

U.S. Aluminium Production.—With the December production of 103,924,830 lb. bringing the total output for the year to 1,244,358,193 lb., production of primary aluminium in the U.S.A. last year showed an increase of 100 million lb. over 1947.

New Canadian Industry.—A $100,000 Canadian plant will be constructed within the next six months to process perlite for use with cement, it is stated by officials of Western Gypsum, Ltd., of Calgary. The plant will be the first of its kind in Canada. A large deposit of perlit, a volcanic lava, was found in western British Columbia.

Productive Arctic Mines.—Mining operations in Nordland province, Norway, last year showed excellent results according to the Royal Norwegian Information Service, New York. During that period the 1600 miners in the province produced over 500,000 tons of ore including zinc, copper and pyrites concentrates.

American Chemists' Congress.—Some 5000 chemists are expected to attend the 115th annual meeting of the American Chemical Society to be held in San Francisco from March 28 to April 1. Reports will be submitted on methods of preventing air pollution, and chemotherapy, on the development of new insecticides and new methods of food analysis.

South African Tung Oil.—Though a considerable amount of tung oil has still to be imported into South Africa—paint manufacturers there used some 295 long tons in the first six months of last year—the Union is rapidly increasing its production. It averaged about 50 tons annually from 1938 to 1943. Soon, however, the increase of the country's 100,000 tung oil trees, existing in 1942, to 300,000 in 1946, had effect. In 1947, about 170 long tons of the oil were produced and this figure has been increased by about 80 long tons a year.

ECA Aluminium Experts for Europe.—A message from Washington states that two American experts left last week for England, Belgium, and the Netherlands to conduct a survey of the aluminium needs of Europe on behalf of the Economic Co-operation Administration. They are Mr. Donald Colwell, sales engineer of the Apex Smelting Co., Chicago, one of the largest secondary aluminium smelting companies in the U.S.A., and Mr. Albert Butler, of Denver, Colorado, formerly with the aluminium-magnesium division of the War Production Board

Matchbox Hazard.—A skin disease which has swept through Central Baden, in the United States zone of Germany, has been traced to phosphorus on the ignition strips of certain match boxes. Investigators found that when boxes were carried in trouser pockets vapour from the igniters caused inflammation, which became worse if exposed to other chemical elements.

Japanese Aluminium for U.S.A.—The severe shortage of finished aluminium sheets in the U.S.A. may be eased by Japanese shipments, according to a statement by the president of the Manhattan Brass & Copper Co., distributors for the Aluminium Company of America. Some 1000 tons of sheets are reported to have been offered in the official channels at a price slightly below that of similar British products.

New Canadian Fibre.—A new fibre, Orlon, which was stated to have some better properties than nylon, is now being put into production according to Mr. Douglas Walkington, of Canadian Industries, Ltd. Mr. Walkington was addressing the St. George Kiwanis Club, Montreal, and also showed some of the new plastic products, including nylon, glass fibre cloth, and "ardil" a cloth made from peanuts.

British Celanese Overseas Subsidiary.—The directors of British Celanese, Ltd., have decided, in view of the increasing importance of the company's export trade, to form a wholly-owned subsidiary, British Celanese (Overseas), Ltd. The capital of the company will be £100,000, and will begin trading on April 1. It will at first concern itself solely with the export of the parent company's products.

Brazilian Steel Output.—According to statistics in the *Bulletin of the Brazilian Ministry of Foreign Affairs*, production of steel ingots in Brazil, rose steadily from 21,000 tons in 1930 to 114,000 tons in 1939, and further to 388,000 tons in 1947. Production in the first nine months of last year was 357,000 tons, i.e., at an annual rate of 476,000 tons representing an increase of 22.7 per cent over the 1947 figure. It is expected that the Volta Redonda steel plant will soon be operating at full capacity—at a rate of 250,000 tons per annum. This, the largest unit in Brazil, together with 24 other steel producers there, now supplies 50 per cent of the domestic consumption.

Scientists and Chemists Commemorated

THE skilful representation of various industries in stamp design by many countries brings to mind the names of famous men whose pioneer work was the source from which some of the industries originated. It is appropriate that the philatelic designer should turn his attention to some of the outstanding figures.

Reproduced below is a series of stamps which commemorate the work done by some of the world's outstanding scientists, physicists and chemists. It is interesting to note that several new stamp issues of a similar character are either planned or now being produced.

On June 2, 1939, Sweden issued a set of four stamps to commemorate the 200th anniversary of the Swedish Academy of Sciences, and two of the values—10 ore (violet) and 30 ore (blue)—show Baron Johan Berzelius, who contributed much to the atomic theory and invented the lamp which bears his name.

An interesting French stamp issue is that of 1936, marking the centenary of the death of Andre Ampère, the physicist, electrician and mathematician. Ampère was a pioneer of electro-dynamics, and the 75 centime (brown) stamp design produced in his honour carries a good portrait of this famous figure, with suitable inscription.

Otto von Guericke, the German electrician and scientist, is recalled in the stamps of Germany, issued on May 4, 1936—250 years after his death at Hamburg. A striking picture of this inventor of the air pump adorns a 6 pf. (green) value.

Italy produced a four-value series of stamps on March 5, 1927, to mark the centenary of the death of Count Alessandro Volta, celebrated scientist and inventor of the first electric battery. The highest denomination of this special issue is illustrated, the 1 lire, 25-cents (bright ultramarine). Other values are 20 c. (crimson), 50 c. (blackish-green), and 60 c. (brown-purple).

Ignace Moscicki, the Russian-born electrochemist, electrophysicist, inventor and writer on scientific subjects, who died on October 2, 1946, appears on several Polish stamp issues. Moscicki organised chemical research institutes and large factories for the manufacture of synthetic fertilisers. He owned over 600 patents, mainly in electrochemistry and electrophysics, and was internationally known for making synthetic nitric acid. The most appealing set of Moscicki stamps is unquestionably that of Poland's 1938 issue, honouring his 70th birthday on February 1. The values are 15 gr. (greenish-slate) and 30 gr. (purple).

The French scientist, A. L. Lavoisier, who gave the world the word "oxygen," appears on the 4 f. denomination of an issue of France released in 1943 (*not shown*).

* Previous issues of stamps reproduced in THE CHEMICAL AGE recently were :— Coal **59**, 491 ; Steel **59**, 727 and Chemicals **60**, 56.

Left (above) : Johan Berzelius, Sweden ; (below) : Ignace Moscicki. Centre : André Marie Ampère, France. Right (above) : Otto von Guericke, Germany ; (below) : Alessandro Volta, Italy

Next Week's Events

MONDAY, FEBRUARY 21

Institute of Welding. London: Institution of Civil Engineers, Great George Street, S.W.1, 6.0 p.m. Joint meeting with the Electrodepositors' Technical Society. E. V. Beatson: "The Welding, Brazing and Soldering of Coated Metals."

Royal Society of Arts. London: John Adam Street, Adelphi, W.C.2, 8.0 p.m. First of two Cantor lectures. W. H. J. Vernon: "The Corrosion of Metals."

Society of Instrument Technology. London: Manson House, Portland Place, W.1, 6.30 p.m. G. P. Clay: "Standardisation of Instruments."

TUESDAY, FEBRUARY 22

Society of Chemical Industry. London: King's College, Strand, W.C.2, 7.0 p.m. Annual general meeting; 7.30 p.m. Discussion: "Process Research in the Fine Chemical Industry"—Dr. H. J. Barber: "The Research Laboratory"; Dr. G. M. Dyson: "The Development Department"; F. J. Bolton: "The Production Department."

The Chemical Society. Manchester: University, 6.30 p.m. Lecture by Prof. V. Prelog (University of Zurich).

Society of Dyers and Colourists. Huddersfield: Field's Café, Westgate, 7.30 p.m. Discussion: "Piece Carbonising and Faults Developing Therefrom."

Society of Public Analysts and Other Analytical Chemists. (Physical Methods Group). London: Institute of Physics, 47 Belgrave Square, W.1, 6.0 p.m. F. Wokes and G. Slaughter: "Some Experiments with the Spekker Photoelectric Absorptiometer and Fluorimeter"; R. A. C. Isbell: "Recent Modifications in the Spekker Photoelectric Absorptiometer."

Institute of Fuel. London: Institution of Mechanical Engineers, Storey's Gate, S.W.1, 2.30 p.m. G. Nonhebel: "Control of Water Treatment for High-Pressure and Low-Pressure Boilers."

WEDNESDAY, FEBRUARY 23

Society of Chemical Industry. (Food Group). London: Royal Sanitary Institute, Buckingham Palace Road, S.W., 6.0 p.m. Joint meeting with the Royal Entomological Society of London. J. Pryce Jones: "The Origin, Composition and Properties of Honey."

Manchester Literary and Philosophical Society. (Chemical Section). Manchester: Portico Library, Mosley Street. 5.30 p.m. Dr. W. J. S. Naunton: "Rubber and Chemistry."

THURSDAY, FEBRUARY 24

The Chemical Society. Edinburgh: North British Station Hotel, 7.30 p.m. Joint meeting with the R.I.C. and S.C.I. R. C. Chirnside: "Analytical Chemistry, Chemical Analysis and the Analyst." Hull: University College, 6.0 p.m. Joint meeting with Hull and District Section of R.I.C. and University College Scientific Society. Prof. M. Polyani: "The Nature of Scientific Convictions." Manchester: Engineers' Club, 6.45 p.m. Joint meeting with the R.I.C. and S.C.I. Dr. R. P. Linstead: "Some Recent Developments in Inorganic Chromatography." Nottingham: University, 6.30 p.m. Prof. C. A. Coulson: "The Shape of the Chemical Bond."

Royal Institute of Chemistry. Leicester: College of Technology, 7.15 p.m. "Synthetic Detergents."

The Royal Society. London: Burlington House, W.1, 4.30 p.m. The Berzelius Memorial Lecture by Sir Harold Hartley.

Institution of Chemical Engineers. London: Burlington House, W.1, 5.30 p.m. Joint meeting with the Physical Society (Low Temperature Group). E. W. Colbeck: "Materials of Construction for Use at Low Temperatures."

British Association of Chemists. London: Swan Hotel, Cosmo Place, Southampton Row, W.C.1, 6.45 p.m. Forum and discussion: "The Chemist as an Administrator."

FRIDAY, FEBRUARY 25

The Chemical Society. Aberdeen: Marischal College, 7.30 p.m. Joint meeting with local sections of the R.I.C. and S.C.I. Prof. D. H. Everett: "Some Factors Influencing the Strengths of Acids and Bases." St. Andrews: United College, 5.15 p.m. Joint meeting with the R.I.C. and the University Chemical Society. Prof. C. E. H. Bawn: "Free Radicals and Hydrocarbon Chemistry."

Institute of Metals. Sheffield: Grand Hotel, 6.30 p.m. Joint meeting with Sheffield Trades Technical Society. E. J. Bradbury: "Melting and Rolling of Nickel Silver."

Sir John Cass Technical Institute. London: Jewry Street, Aldgate, E.C., 6.0 p.m. First of six lectures. J. V. Westwood: "Theory and Practical Applications of Polarography."

Methods of Flax Processing.—An address on "Flax Processing and Quality" was recently given by Mr. Ferguson Grainger in Belfast to the Irish Section of the Textile Institute. He traced the history and processes from the primitive forms of the old flax mill to the modern factory.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsibe for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

FROME CHEMICAL CO., LTD. (M., 19/2/49.) January 5, debenture, to Lloyds Bank, Ltd., securing all moneys due or to become due to the Bank; charged on factory and premises at Christchurch Street, East, Frome, and a general charge. *£2624 Bankers. August 11, 1948.

K. D. G. INSTRUMENTS, LTD., London, E.C. (M., 19/2/49.) December 30, £50,000 debenture, to Wallring Investments, Ltd.; general charge. *Nil. July 14, 1948.

PLASTIC MOULDING CO., LTD. (formerly Marcel Walters, Ltd.), London, W.C. (M., 19/2/49.) January 5, debenture No 1 securing £2500, to Strand Nominees, Ltd.; general charge. *Nil. May 31, 1946.

SOUTHERN INSTRUMENTS, LTD., Camberley. (M., 19/2/49.) January 5, debenture, to Industrial and Commercial Finance Corporation, Ltd., securing all money and liabilities now or at any time or times due owing or incurred by the company to the holders; charged on "Fernhill," Hawley, and buildings erected or to be erected thereon. *Nil. December 31, 1944.

Satisfactions

BRITISH CELANESE, LTD., London. (M.S., 19/2/49.) Satisfaction January 6, of trust deed and supplemental deed registered October 2, 1943, and November 8, 1944, to the extent of £42,242.

COLLIER DOWELL METAL FINISHES, LTD., London, W. (MS., 19/2/49.) Satisfaction January 6, of debentures registered February 25, 1948.

THOMAS ROBINSON (MANUFACTURING CHEMISTS), LTD., Manchester. (M.S., 19/2/49.) Satisfaction January 5, of charge registered October 28, 1947.

Company News

Borax Consolidated, Ltd., has declared a final dividend of 6 per cent, plus a bonus of 2½ per cent on the deferred ordinary stock. Trading profit for the year ended September 30, 1948 was £1,037,735 (£1,159,287).

The name of Pest Control, Ltd., has been changed to **Pest Control (United Kingdom), Ltd.**

The following increases in registered capital are announced: **Shell Chemicals, Ltd.,** from £300,000 to £500,000; **Griffin & Tatlock, Ltd.,** from £100,000 to £180,000; **Peldo, Ltd.,** from £100 to £2500; **A. H. Gadsby & Co., Ltd.,** from £200 to £2000.

New Companies Registered

Horticultural Fertilisers and Sundries, Ltd. (464,110). Private company. Capital £500. Manufacturers of fertilisers, chemists, etc. Directors: R. J. T. Morton and Miss J. E. Morton. Reg. office: 16 Hanworth Road, Feltham.

Wazir Ali (G.B.), Ltd. (464,347). Private company. Capital £45,000. Importers and exporters of minerals, chemicals, metals, etc., shipping agents, shipowners and contractors in Great Britain and throughout the world. Directors: Syed Amjad Ali, Syed Wajid Ali, Sir J. R. Abercrombie, W. H. Mason. Reg. office: 4 London Wall Buildings, E.C.2.

Chemical and Allied Stocks and Shares

THE reaction to the fall in American commodity prices has continued to depress stock markets, base metal mining and oil shares being the chief sufferers. Sentiment has also been affected by fears that Marshall Aid might have to be reduced if there were any serious fall in commodities. In responsible quarters, however, it is believed that the present reaction is only temporary and that any rally in Wall Street would quickly be reflected by markets here.

Meanwhile, base metal shares have fallen sharply; declines in Rhokana and Rio Tinto on Monday, for instance, were 10s., while Zinc Corporation lost 3s. 9d. and North Broken Hill fell another 2s. 6d. at the beginning of this week. In oils, Anglo-Iranian, which a fortnight ago were over £9, have fallen to £8¼, while Shell are back to close on 70s.

Selling has not been heavy, but with buyers awaiting a rally by Wall Street, jobbers found themselves well equipped with shares, with the result that moderate selling has a disproportionate influence on prices.

Leading industrials lost ground with the general trend and carried down chemical and kindred shares. Imperial Chemical, after rallying to close on 46s. 6d. following the denial of new capital rumours, have

since come back to 45s. 7½d. at the time of writing. Turner & Newall have also recovered to 83s. 10½d., Courtaulds to 37s. 3d., and British Celanese to 19s. 4½d.

Borax Consolidated, which continued to be affected by the reduced profits announced for the past year, declined further to 58s. 9d. A fortnight ago the price of the latter was 63s. 9d., Lever & Unilever eased to 46s. 9d. and Lever & Unilever N.V. to 44s. 6d. The Dutch company is making a big issue in Holland of Fl. 75,000,000 of 3½ per cent notes at 101 per cent, which will bring in the equivalent of over £7 million to provide for expansion of business and for new plant and acquisitions, including the purchase of the United States "Pepsodent" business. Consolidated results of the English and Dutch Lever & Unilever companies for 1948 will be approximately the same as for 1947, with dividends maintained.

Albright & Wilson 5s. shares have remained firm at 31s., Laporte 5s. ordinary were also well maintained at 21s. 3d. and Fisons held their rise, having again changed hands around 60s. In other directions, Glaxo Laboratories eased to £22½, but British Drug Houses 5s. ordinary were firmer at 9s. and Monsanto Chemical 5s. shares remained at 62s. 6d.

On the other hand, the 4s. units of the Distillers Company have eased to 28s. 10½d., United Molasses to 48s. 3d., British Plaster Board 5s. ordinary to 23s. 7½d. and Associated Cement to 79s. 3d., while British Aluminium at 51s. 3d. were slightly below the level of a week ago.

William Blythe 3s. shares remained in favour, changing hands up to 21s. 6d. in anticipation of the financial results. Elsewhere, Blythe Colour 4s. ordinary receded to 58s. following publication of the past year's results; profits have not held the previous year's high level, but shareholders again receive 80 per cent.

There was again a good deal of activity in colliery shares in response to market estimates of final compensation values. Bolsover rallied to 62s. 9d., Shipley to 45s. 6d., but Staveley eased to 86s. 6d., Pease & Partners to 20s. 6d. and Powell Duffryn to 29s. 7½d., while Doncaster Amalgamated fell sharply to 19s.

Hadfields strengthened to 31s. 3d. on the financial results, the company's claim that it should not be nationalised, and the reference by the directors that on balance sheet figures the 10s. shares have a break-up value of over £3 each, compared with the proposed nationalisation "compensation" of £1 10s. 0d.

Oils were again lower, Anglo-Iranian falling to £8¼, Shell to 71s. 3d. and Trinidad Leaseholds 5s. shares to 28s. 6d.

British Chemical Prices

Market Reports

THE market for industrial chemicals remains unchanged both as regards prices and business. Indeed so far as prices are concerned the undertone is decidedly strong. Delivery specifications to the home consuming industries have been on a good scale and inquiries for new business have been fairly well spread over all sections of the market. The overseas demand for industrial and fine chemicals remains on a good scale and reports indicate that the high level of chemical exports has been fully maintained. Among the soda products there is a steady call for hyposulphite of soda, caustic soda, bichromate of soda and chloride of soda and an active interest is maintained in nitrate of soda at the recently advanced rates. There is nothing of fresh interest to report on the market for potash chemicals and with regard to other sections of the market supplies appear to be equal to the demand. In the coal-tar products market there is an active demand from the home users for pitch and a satisfactory trade in this item is being done with the Continent. Creosote oil is in fair demand, as is cresylic acid, while offers of pyridine are fully absorbed. The demand for toluol is sufficient to take care of available supplies.

MANCHESTER.—Home-trade pressure for supplies of both light and heavy chemicals shows no sign of easing on the Manchester market and the volume of inquiry during the past few days has been maintained at a satisfactory level, with replacement business in textile and other industrial chemicals fairly substantial in the aggregate. Export bookings have been of fair extent, shippers pressing for deliveries of chemicals already ordered. Price conditions are strong pretty well throughout the market. In the fertiliser section there is increasing activity in a number of directions and the next few weeks should see the demand for certain materials approaching its seasonal peak. Pressure for supplies of the tar products has been well maintained.

GLASGOW.—Conditions in the Scottish chemical market have again indicated that there has been no lessening during the past week of scarcity of money; the total turnover has been on a restricted scale. The sales of materials used for fillers in packed powders has been on a decreasing scale for some time, some of the smaller firms having found themselves in financial difficulties. In general, however, sales of chemicals for strictly industrial purposes have been satisfactory and demand has been well met. There has been a slight increase in the demand for certain coal-tar products.

Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patent Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Glazed articles.—Lafarge Aluminous Cement Co., Ltd., and T. D. Robson. July 23, 1946. 614,542.

Machines for making cores for use in the art of casting metals.—J. W. Athey. July 24, 1946. 614,693.

Manufacture of chromates of alkali metals.—Chrome Chemicals (Aust.) Pty., Ltd. Sept. 15, 1945. 614,443.

Manufacture of powder metal compacts and diamond tools.—Boart Products, South Africa (Proprietary), Ltd. April 6, 1944. (Divided out of 605,261.) 614,544.

Device for producing movement between relatively movable members.—C. Churchill & Co., Ltd., and C. H. Mould. March 10, 1944. 614,905.

Apparatus for heat-exchange between two flowing media.—D. Dalin, and G. V. Hagby. Nov. 6, 1943. 614,908.

Method of anodically polishing stainless steel.—A. H. Stevens. (Battelle Memorial Institute.) Dec. 18, 1944. 614,909.

Preparation of unsymmetrically substituted guanidines and acid salts thereof.—American Cyanamid Co. Aug. 11, 1944. 614,916.

Method of producing emulsions of the oil in oil type.—Grindestedvaerket A/S. Sept. 15, 1941. 614,925.

Production of metanilamidodiazines.—American Cyanamid Co. Feb. 14, 1945. 614,926.

Production of Diels-Alder abducts.—Velsicol Corporation. March 5, 1945. 614,931.

Process for obtaining an intermediate for antibiotic compounds.—Abbott Laboratories. May 7, 1945. 614,938.

Spinning of artificial filaments.—E. I. Du Pont de Nemours & Co. July 12, 1945. 614,959.

Art of bending and tempering sheets of glass.—Pilkington Bros., Ltd., G. W. T. Bird, and J. Dennett. July 22, 1946. 614,726.

Welded components of corrosion resistant alloy steel.—Babcock & Wilcox, Ltd. July 26, 1945. 614,732.

Die casting of metals.—Birmingham Aluminium Casting (1903) Co., Ltd., and W. A. Baker. July 24, 1946. 614,750.

Treatment of wool.—British Cotton & Wool Dyers' Association, Ltd., P. W. Cunliffe, J. L. Sharp, and F. Ashworth. July 24, 1946. 614,966.

Manufacture of dyes.—British Celanese, Ltd. July 24, 1945. 614,969.

Extracting oil from fish-liver or other oil containing parts of fish or marine animals.—Separator A/B. Sept. 15, 1945. 614,972.

Dispersions of polymeric materials.—E. I. Du Pont de Nemours & Co. July 26, 1945. 615,125, 614,762.

Device for advancing filaments and the like under tension.—E. I. Du Pont de Nemours & Co. July 26, 1945. 614,978.

Manufacture of quaternary ammonium phenoxides.—I.C.I., Ltd. July 27, 1945. 614,763.

Treatment of jute.—W. G. Atkins, and H. J. Callow. July 26, 1946. 615,132.

Process for the manufacture of 3 : 4-di-(*p*-hydroxyphenyl)-hexanediol-3 : 4.— Roche Products, Ltd. Sept. 14, 1945. 614,983.

Process for the manufacture of amino-substituted tertiary carbinols.—Roche Products, Ltd. A. L. Morrison, and H. Rinderknecht. July 27, 1946. 615,136.

Manufacture of amides of α-β-unsaturated carboxylic acids.—R. M. Hughes. (J. R. Geigy, A.G.) July 27, 1946. 615,137.

Manufacture of esters of pyridyl-3-carbinol.—Roche Products, Ltd. (F. Hoffman-La Roche & Co., A.G.) July 27, 1946. 614,772.

Methods and apparatus for treatment of filaments.—American Viscose Corporation. Dec. 6, 1945. 615,140.

Apparatus for delivering measured quantities of liquids.—Machinery Engineers & Designers, Ltd., A. Askey, and E. W. Burton. July 29, 1946. 615,146.

Machines for washing minerals, ores, and the like solid materials.—I.C.I., Ltd., A. Ratcliffe, and G. W. Talbot. July 29, 1946. 615,149.

Coating compositions.—I.C.I., Ltd. (Canadian Industries, Ltd.) July 29, 1946. 614,781.

Method of producing a derivative of the blood-sugar decreasing hormone, and the insulin derivative thereby produced.—Novo Terapeutisk Laboratorium A/S. Dec. 13, 1943. 614,990.

Treatment of yarns and like materials.—British Celanese, Ltd. July 31, 1945. 615,162.

Extrusion apparatus.—B.X. Plastics, Ltd., and D. C. Nicholas. July 30, 1946. 614,800.

Composite metallic articles and method of forming same.—United States Rubber Co. Oct. 16, 1945. 615,174.

Pumps for liquids.—E. J. H. Norman, Aug. 1, 1946. 614,821.

Sizing yarn.—British Nylon Spinners, Ltd., G. Loasby, and A. R. Munden. Aug. 2, 1946. 615,185.

Use of polyester-amide compositions for coating, impregnating, adhesive or like purposes.—I.C.I., Ltd., J. G. Cook, J. T. Watts, and H. G. White. Oct. 2, 1946. 579,340.

Composition comprising polymeric materials.—I.C.I., Ltd., H. G. White, and W. F. Smith. Aug. 2, 1946. 614,829.

Curing of polymeric materials.—I.C.I., Ltd., D. H. Coffey, W. F. Smith, and H. G. White. Aug. 2, 1946. 614,992.

Treatment of polymeric materials.—I.C.I., Ltd., D. A. Harper, B. J. Habgood, and R. J. W. Reynolds. Aug. 2, 1946. 614,993.

Curing of polymeric materials.—I.C.I., Ltd., D. A. Harper, and H. P. W Hugill. Aug. 2, 1946. 614,994.

Lubricating grease compositions.—Carbide & Carbon Chemicals Corporation. Aug. 22, 1945. 615,188.

Foaming galvanising fluxes.—E. I. Du Pont de Nemours & Co., and L. D. Eubank. Aug. 6, 1946. 614,847.

Moulding liquid metal.—F. L. Duffield. Aug. 6, 1946. 614,848.

Machines for pre-treating plastic materials.—Bata Narodni Podnik. Sept. 1, 1942. 615,202.

Aluminium base alloy.—R. M. Bradbury. Aug. 13, 1946. 614,898.

Manufacture of heterocylic compounds.—Boots Pure Drug Co., Ltd., P. Oxley, and W. F. Short. Aug. 13, 1946. 615,006.

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AN expanding Middle East Oil Company urgently requires an Assistant Engineer to work initially in the London Office and be willing to accept transfer to the Persian Gulf after one year. Should possess B.Sc. Degee in Chemical or Mechanical Engineering. Will be required to assist in duties involving loading and bunkering facilities, oil gas distribution, and other oil control duties. Some experience of these duties essential. Experience in oil bunkers control with docks operating group of the Royal Engineers may be advantageous. Age 25–30. Salary starting £600-£700 per annum according to age and experience. Write, giving brief details, for application form, and quoting LO 133, to Box "P.Y." c/o J. W. VICKERS & CO., LTD., 7/8, Great Winchester Street, London, E.C.2.

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BRITISH Titan Products Co. Ltd., have a vacancy for a Junior Plant Manager at their new Grimsby factory. Candidates for the appointment should be a graduate of a British University with first or second class honours and in addition to a chemical training should have an interest in chemical engineering. Applications in respect of this advertisement should be addressed to: **The Secretary, British Titan Products Co. Ltd., Billingham, Co. Durham.**

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CHEMIST required in metallurgical laboratory in North London to undertake assaying in base metals ores, concentrates and residues, including tungsten. Give full details, experience and salary required. Box No. 2765, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

THE CIVIL SERVICE COMMISSIONERS invite applications for the following appointments in Government Departments to be filled during 1949, by competitive interview. Interviews will be held throughout 1949. Successful candidates may be appointed immediately.

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(2) **SCIENTIFIC OFFICERS.** Candidates must be at least 21 and under 28 years of age on 1st August, 1949. They must have obtained a university degree in a scientific subject (including engineering) or in mathematics with first or second class honours or an equivalent qualification or possess high professional attainments. Candidates sitting for their degrees in 1949 may be admitted to the competition before the result of their degree examination is known.

The appointments announced in (1) and (2) cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. They will be held in various Government Departments (Ministry of Supply, Admiralty, Department of Scientific and Industrial Research, Air Ministry, Ministry of Agriculture and Fisheries, Ministry of Civil Aviation, Scottish Home Department, Home Office, Ministry of Works, War Office) and the places of work are spread throughout Great Britain. Each candidate is given the fullest opportunity to express his preference in the subject of work and the Government Department and particular establishment to which he wishes to be appointed.

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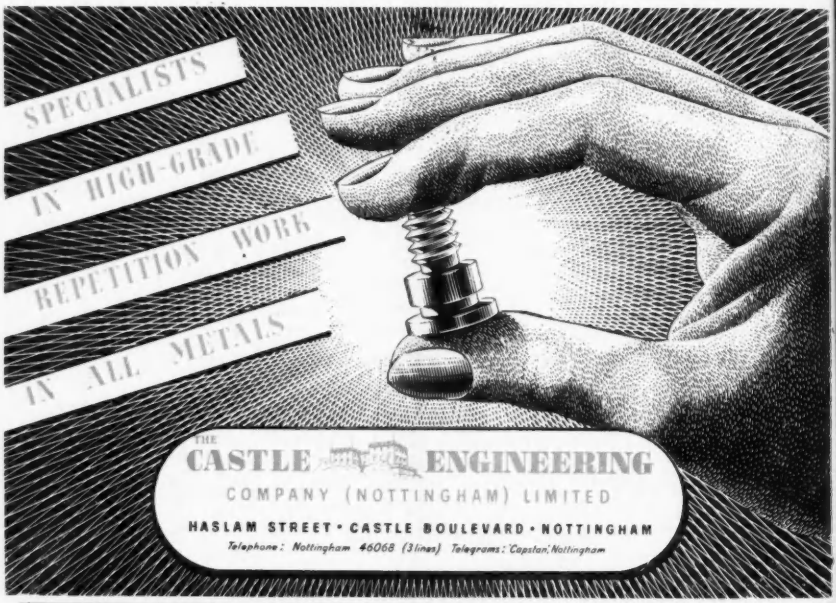

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